THE SCIENTIFIC ENGLISH PROSE OF WILLIAM TURNER (1508-1568)

VALERIE BULLOCK

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by

Valerie Bullock

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ABSTRACT

The sixteenth century opened the door to modern science. The printing press, together with other technological advances, gave impetus to that spirit of inquiry based on personal observation and experiment. Mediaeval thinking was questioned, mediaeval theories were tested and if disproved, discarded. On the continent and in England men became inspired to set down the results of their scientific inquiries, not only in Latin, but in their native languages. In doing this they often met with difficulties.

This essay discusses William Turner in this context as a writer of such early English scientific prose. Although he was a physician of some eminence and a notable preacher for the Reforming cause, it is as the "Father of English Botany" that he is remembered. Much of his early writing was in Latin, but in the service of botany he attempted to make his native English a language of scientific instruction for his countrymen.

Turner was only partially successful. He could not completely overcome the theories of mediaeval herbalism, although he vigorously dismissed much that was fanciful in plant lore and substituted what his own senses, coupled with

his knowledge of the works of ancient botanists, revealed. It is interesting to trace his attempts to explain in terms of measurement the "degrees" aspect of the theory of humours, even though the very theory is too nebulous to allow such precision.

He was more fortunate in his attempts to use the vernacular for the description and identification of plants and in this area he broke new ground in the use of the English language for scientific purposes. This essay attempts to reveal his struggles for technical precision and clarity, with all the necessary rejections and substitutions of words, phrases and images. This leads to the inevitable conclusion that Turner's gain in accuracy results in the loss of that charm associated with mediaeval herbals.

Finally it is suggested that in his attitude to language and his persistence in the use of English prose to instruct and inform about scientific matters, Turner anticipated the Royal Society by a hundred years.

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LIST OF ABBREVIATIONS

Anatomy	Nehemiah Grew, The anatomy of plants; 1682. Micro Fi. 123.
Banckes's Herbal	An Herbal (1525), Ed. Sanford V. Larkey and Thomas Pyles.
Baths	William Turner, A Booke of the natures and properties; as well of the bathes of England as of other bathes in Germany and Italy, 1562. S.T.C. 24366.
English Naturalists	Charles E. Raven, English Naturalists from Neckam to Ray A Study in the Making of the Modern World, 1947.
Facsimiles	William Turner. Libellus de Re Herbaria 1538 The Names of Herbes 1548, Facsimiles with introductory matter by James Britten, B. Daydon Jackson and W.T. Stearn, 1965.
Herbal Part 1	William Turner, A new herball, 1551. S.T.C. 24365. Except where it is stated to the contrary, this earlier version of the first part of the herbal is the one quoted, as the revised version (S.T.C. 24367) contains a vast number of printer's errors and, in addition, the microfilm itself is less clear.
Herbal Part 2	William Turner, The seconde part of William Turner's herball, 1562. S.T.C. 24366. This part was reprinted, without the dedication; in the final edition of the herbal, which follows:
Herbal Part 3	William Turner, The first and seconde partes of the herbal lately oversene, with the thirde parte; also a booke of the bath of Baeth, 1568. S.T.C. 24367.
Libellus	William Turner Libellus de Re Herbaria 1538 See Facsimiles above.

Names	William Turner The Names of Herbes 1548 See Facsimiles above.
Natural History in Tudor England	F.D. Hoeniger and J.F.M. Hoeniger The Development of Natural History in Tudor England. 1969
Natural History in Stuart England	F.D. Hoeniger and J.F.M. Hoeniger The Growth of Natural History in Stuart England From Gerard to the Royal Society. 1969.
S.T.C.	Short-Title Catalogue of books printed in England, Scotland and Ireland and of English books printed abroad 1475-1640. A.W. Pollard, et al., comps. 1969.
O.E.D.	Oxford English Dictionary. ed. James Augustus Murray et al. 1970.
Wines	William Turner A new Boke of the natures and properties of all Wines. 1568. S.T.C. 24360.

DEPARTURES FROM THE TEXTS

Quotations from sixteenth-century texts retain the original punctuation and spelling, apart from -

1. Expanding aphetic forms e.g. "when" for "whē
   "the" for "y^{e}"
   "and" for "&"

2. Giving the present day conventions of "u" and "v"
   e.g. "upon" for "vpon"
   "leves" for "leues"

3. In quotations from the second and third parts of Turner's herbal, the oblique strokes used for punctuation have been removed and commas inserted where the sense requires it.

4. Definitions of archaic or obsolete words and of some words still in use but with changed meanings are enclosed in square brackets and obvious misprints corrected.

5. Capitalisation or otherwise, including that of plant names, is Turner's own in that part of the work to which reference is being made.

TEXT OF THESIS

Chapter I INTRODUCTION AND BIOGRAPHIC

Chapter II TURNER'S ATTITUDES TO CONTEMPORARY SCIENCE

- Turner's use of the vernacular
- Turner's attitude to authorities, as exemplified by the doctrines of degrees and humours
- Turner's attitude to the doctrine of signatures
- Turner's attitude to transmutation of species
- Insights gained from the religious tracts

Chapter III THE ELEMENTS OF TURNER'S SCIENTIFIC STYLE

- Part 1. The historical background of Turner's scientific prose
- Part 2. Turner's descriptive prose and terminology
- Part 3. Turner's prose as practical rather than poetic

Chapter IV TURNER IN THE SCIENTIFIC CONTEXT

CHAPTER I

INTRODUCTORY AND BIOGRAPHICAL

It is a commonly-held opinion that the modern world began with the seventeenth century. "Modern" here is almost synonymous with "scientific", implying the start of an era in which knowledge meant, simply speaking, those facts which could be reproduced and demonstrated.

During the sixteenth century a large segment of the European population, including the British, became less dominated by the religious authority of mediaeval times and increasingly influenced by the results of scientific investigation. It did not follow that scientific thinking was always at odds with religious faith. Some learned men in every age have harmoniously combined the two. Roger Bacon, the thirteenth century Franciscan, included mathematics and science within his broad love of knowledge and in these disciplines at least, replaced argument with experiment. He, however, was a man ahead of his time.

There were more of his temper two centuries later, when men started to turn back from the theories - usually non-verifiable - of mediaeval "scientists" to the earlier writings of the Greeks and Romans, gradually using the more

practical of the classical authors as a springboard for their own research. Personal investigation, observation and measurement became as important as reading, discussion and debate. Technology and science advanced together as the value of precision was recognized. Nicolas da Cusa realised the importance of accuracy in the measurements of weight and time. Leonardo da Vinci and Albert Dürer became absorbed, quite independently, in ideas on linear perspective, and da Vinci added a new dimension by including aerial perspective. By 1496, Abraham Zacuto could table his declination of the sun and planets to establish latitude.

Such was the tenor of the times. It persisted despite the mockery of such highly-regarded minds as Erasmus who, in The Praise of Folly (1514), said of scientists "How senilely they daydream, while they construct their countless worlds and shoot the distance to the sun, the moon, the stars, and spheres, as with a thumb and line." Yet, he added, "They can never explain why they disagree with each other on every subject."[1]

People were not slow to avail themselves of the large number of translations from the classics made available by the printing press and from the mid-fifteenth

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[1] The Essential Erasmus, ed. John P. Dolan (New York: New American Library, 1964), p. 142.

century the reading public increased. This in turn encouraged writings in the vernacular and helped to develop in England, largely through the efforts of Caxton and Wynken de Worde, a more standardised English language. By 1500, larger thought-patterns were being stimulated amongst more people and the search for knowledge accelerated. It is not surprising that the period from 1500 to 1540 is now considered to have been a watershed in science.

Into this watershed, around the year 1510, William Turner, afterwards named "the Father of English Botany" was born in Morpeth, Northumberland, probably the son of a tanner, according to B.D. Jackson's biography of him.[2] Nothing is known of his early education, though it was probably at a local grammar school. However, his future writings make it evident, as C.E. Raven points out, that whilst still young "he began to notice the ways of birds and plants."[3] His herbal, as the next chapters demonstrate, is full of references to Morpeth, to specific plants growing in the countryside around Morpeth and to local plant names.

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[2]William Turner, Libellus de Re Herbaria 1538 The Names of Herbes 1548 Facsimiles, introductory matter by James Britten, B. Daydon Jackson and W.T. Stearn (London: Ray Society, 1965), p. 15 (hereafter cited as Facsimiles).

[3]Charles E. Raven, English Naturalists From Neckam to Ray A Study of the Making of the Modern World (Cambridge: University Press, 1947), p. 49 (hereafter cited as English Naturalists).

Of the subject which was to become his life's work, Turner obviously learned more outside school than in, though his classical education would be good preparation for the reading of Latin and Greek texts which motivated the botanical studies of his maturity. But close first-hand experience in the field seems to have been part of his life from very early years. It is interesting to note that whilst Turner was growing up, a young Spaniard, Juan Luis Vives, was propounding ideas which were to influence educationalists and their students for many years to come. He was concerned with the importance of the senses and considered first-hand experience to be the foundation of intellectual activity: "I only call that knowledge which we receive when the senses are properly brought to observe things and in a methodical way to which clear reason leads us on."[4]

Such ideas were forerunners of the inductive method of research and of the processes of personal investigation, reasoning and judgement which were gradually to test the pronouncements of the classical authorities. Vives lived in England between 1522 and 1528 at the invitation of Catharine of Aragon. During this time he was tutor to

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[4] Vives: On Education, trans. and ed. Foster Watson (1913; rpt. Totowa, New Jersey: Rowman and Littlefield, 1971), p. 22.

Princess Mary, a friend of Sir Thomas More and a lecturer at Oxford. Perhaps his ideas had some indirect influence on Francis Bacon who, fifty years after Turner's death, was urging the same experimental approach to learning. The inductive method was so attractive to Englishmen by the seventeenth century that several of them formed a group which was to become the Royal Society for the Promotion of Natural Knowledge in 1662.

Meanwhile, in the first half of the sixteenth century, the idea of adventurous and independent thinking appealed, both in England and on the continent, to many who supported the Reformation. The same temperament which made Protestants study the newly-discovered Greek Testament and embrace it as the expression of basic Christianity, also made them enthusiastic about classical authors in other areas, including Botany. The same critical and somewhat aggressive spirit which railed against the degeneracy of Roman Catholicism exposed the superstitions of mediaeval science. Eventually, in seeking to interpret the classical authors which they venerated, these same searching minds were not afraid to test these authorities against their own experience and thus the modern scientific intelligence emerged.[5]

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[5]Charles E. Raven, Natural Religion and Christian Theology (Cambridge: University Press, 1953), p. 90.

This type of thinking was part of the university atmosphere, if not of the actual curriculum, when Turner went up to Pembroke College, Cambridge, in 1526. Mullinger, who wrote on the history of the University, gave 1535 as the date of transition from the mediaeval to the modern "though this is perhaps arbitrary, since the process lasted more than a century" (English Naturalists, p. 54). Turner went to Pembroke under the patronage of Thomas, Lord Wentworth, to whose son he later dedicated the second part of his herbal with these words: "And who hath deserved better to have my books of herbes to be given to him, then he, whose father with his yearly exhibition did helpe me, beyng student in Cambridge of Physik and philosophy?"[6]

Turner's studies were successful: he took his B.A. in 1529-30 and his M.A. in 1533, meanwhile becoming Fellow of his College in 1531 and Junior Treasurer in 1532. He was ordained in 1537 and whilst in Cambridge, married Jane, daughter of George Auder, Alderman of the city, by whom he subsequently had a son and two daughters. In 1538 Turner became Senior Treasurer of his College and author of his first botanical work, the Libellus de Re Herbaria (1538), printed in London by John Byddell. The Libellus is written in Latin, and is an alphabetical listing identifying those

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[6]William Turner, The seconde part of William Turner's herball (Cologne, 1562) S.T.C. 24366, sig. A3.

plants named and described by classical authorities, particularly Dioscorides, by matching them with English plants. Where he knows them, Turner gives the English names and sometimes local alternatives. For example, he says that the fruit of Rubus may be called "blackeberyes, aut blackebyers, aut bumbleberys" (Facsimiles: Libellus, sig. C1). Most of the knowledge conveyed here seems to have been learned outside the University, for at the end of his life he wrote in the Preface to the complete edition of his herbal:

> ... I have above thyrtye yeares ago, written an Herbal in Latin, wherein were conteyned the Greke, Latin and Englishe of so many herbes and trees as I coulde get anye knowledge of, even being yet felow of Pembroke hall in Cambridge, wher as I could learne never one Greke, nether Latin, nor English name, even amongest the Phisicions of anye herbe or tre, suche was the ignorance in simples at that tyme.[7]

Although the majority of the notes on plants are brief, sometimes just the Greek name followed by the equivalent Latin and English names, one or two have lengthy discussions which demonstrate the practical care with which Turner approached the matter of identification. For example, he recounts very conversationally in the Libellus

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[7]William Turner, the third part in The first and seconde partes of the herbal of William Turner lately oversene, corrected and enlarged with the Thirde parte (Cologne, 1568), S.T.C. 24367, sig. *2^{v}.

how when on holiday in Norfolk, he saw a little girl with a bunch of flowers which he recognized from botanical texts as Narcissi, but which he had not hitherto seen in England and for which he knew no English name. The child did not know the name either, and Raven translates the rest of Turner's account:

> So I asked the folk who lived in the neighbouring cottages and villages, what was the name of the plant. They all answered that it was called "laus tibi": I could get no other name from them. But when I got home I learnt that asphodel was called by many people "laus tibi". Then a little old man whose name is quarinus Asshe [Warren Hash is the name given in the list of "Rewardes" to the Prior and Canons at the Dissolution in November 1538] a canon of Barnwell Priory and well skilled in herbalism, told me this plant was called French Gillyflower (gelofer). We must use that name until a better is found.
>
> (English Naturalists, p. 63. Raven is translating the Libellus, sig. B3).

From this and from subsequent references to Cambridgeshire it is obvious that Turner spent much time scouring the countryside for plants. However, his other passion was developing too. Whilst at Cambridge he became a close associate of Nicolas Ridley and Hugh Latimer (together burned at the stake in 1555), the former instructing Turner not only in Greek, but in tennis and archery (English Naturalists, p. 53). Through the influence of these men be became an ardent supporter of the Reformation and when he left Cambridge in 1540, he spent some time travelling about England, preaching this faith, and according to Wood's Athenae Oxoniensis:

> In his rambles he settled for a time in Oxon among several of his countrymen that he found there, purposely for the conversation of men and books.... At the same time and after, following his old trade of preaching without a call, he was imprisoned for a considerable time.
>
> (quoted by Jackson in Facsimiles, p. 16)

Raven points out that many Gospellers were seized at this time and that there are no grounds for believing the suggestion that Turner's imprisonment resulted from his refusal to subscribe to the Statute of the Six Articles, or that he recanted to save himself (English Naturalists, p. 74). Certainly he remained outspoken for the rest of his life.

On his release from prison Turner escaped to the continent, or according to Pulteney, submitted to voluntary exile there.[8] However inconvenient this may have been initially, it was a marvellous opportunity for Turner to discover continental plants and to discuss his findings with continental botanists. Many of the latter are mentioned in his second botanical work, The Names of Herbes (1548), which is an enlarged and somewhat revised English version of the Libellus. This book, in addition to Greek, Latin and English names, gives French and German vernacular names also.

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[8]Richard Pulteney, Historical and Biographical Sketches in the Progress of Botany in England, from Its Origin to the Introduction of the Linnaean System, 2 vols. (London: for T. Cadell, 1790), I, 60 (hereafter cited as Pulteney).

Many of the descriptions in this book testify to the extensive travelling and plant hunting by Turner whilst he was in exile. For example, he says of Dryopteris, "I have founde it in bush rootes ofte tymes in Germany" (Facsimiles: Names, sig. C7^{v}-C8) and of Arthemisia, "I saw the right Mugwort in an Ilande beside Venice" (Names, sig. B3). Sometimes he locates plants even more precisely as with the second kind of Athenus, "called in greke chrysanthemon because it hath a golden floure. I founde it once in a corne fielde betwene Basyle and Surike, and have never sene it any where els in all my lyfe" (ibid. sig. B1). He remembers Glaux, "in Flanders by the sea syde, 111 myles from Dunkyrke" (ibid. sig. D4) and Meum "eight mile above Bon" (ibid. sig. E5).

William Stearn suggests that these clues, together with others in later works, indicate that Turner was in Calais, Dunkirk, Cologne, Bonn, St. Goar, Bingen and Mainz "and so presumably travelled up the Rhine to Basel and thence to Italy" (Facsimiles, p. 7). There he visited Venice and Ferrara, for he comments on Cesthus, "It that groweth in Italy, which I sawe in Ferraria hath shorter leaves, then thys cisthus that groweth in Syon" (Names, sig. C3). At Ferrara he studied under Antonio Musa Brasavola, a botanist who,whilst venerating the first-century medical writer Dioscorides, also recognized his

limitations and maintained that the five hundred plants mentioned in Dioscorides's De materia medica libri quinque "did not include a hundredth part of those that grew upon the earth."[9]

In Bologna Turner worked under Luca Ghini who, though no writer, was famous as a teacher of botany and invented the herbarium. Turner refers to him frequently in his writings on plants, as for example, in his description of Bunium in Names: "Bunium is a rare herbe in Englande, to me at the least, for I coulde never fynde it here, but Lucas the reader of Dioscorides in Bonony shewed it me" (Names, sig. B7-B7^{V}). Either at Ferrara or Bologna, Turner took his M.D. degree and then travelled back by Lake Como - he saw Rhus "in the rockes besyde Lake de Come" (ibid. sig. F7) - and through Switzerland, where he saw Verbenaca. "I never sawe it in any place savynge in Swycherland" (ibid. sig. G7). Here in Switzerland he met Conrad Gesner at Zurich and a mutual respect and friendship formed between the two men who subsequently exchanged information on natural history until Gesner's death of the plague in 1565. It is interesting that Gesner's Bibliotheca has an account of Turner's writings up to 1548 which lists many now lost.

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[9]Quoted by Agnes Arber, Herbals Their Origin and Evolution A Chapter in the History of Botany 1470-1670, 2nd ed. (Darien, Conn: Hafner, 1970), p. 11.

Mainly written in Latin, they include commentaries on Latin works, epigrams and a satirical ballad Pro Standicio ad Papam, in addition to two natural history books, De Naturis Herbarum and a book on birds (Raven, English Naturalists, p. 71). Evidently Turner started to write whilst at Cambridge and his scope was broad. Raven shows how a few lines in Gesner's De Herbis Lunariis (1555) reveal that he held Turner in high esteem "is fuerit vir excellentis tum in re medica tum aliis plerisque disciplines doctrinae": "a man of excellent learning both in medicine and in many other fields of study" (translated by Raven in English Naturalists, p. 82).

In 1543 and 1544, Turner lived first at Basel and then at Cologne. At Basel his somewhat vituperative religious treatise supporting the Protestant cause was printed, The huntying and fyndyng out of the Romyshe foxe (1543). It is an outspoken indictment of the abuses of Roman Catholicism and found a good reception in England. Religious and botanical interests continued to occupy Turner and it is evident from references in both The Names of Herbes (1548) and the later herbal that he had a well-stocked garden in Cologne.

It seems likely that during these long stationary periods he met Leonhart Fuchs and Valerius Cordus, both famous for their writings on the medicinal uses of herbs, and Turner continued to correspond with Fuchs for the

remainder of his life. On leaving Germany, he seems to have travelled into Holland and into East Friesland, which he mentions often, as, for example, when he writes of Cingulum, "I have sene it in east Freslande by the sea syde" (Names, sig. C3). He later revealed in the third part of his herbal that he was physician here to "the Erle of Emden" in which capacity he was able to seek out a herb mentioned in Pliny which supposedly healed Roman soldiers of the stomach ache whilst they were in "Freiceland". Pliny gave the name of the herb as Britannica and Turner spent much time searching for it. He writes, "I sayled to an Iland, called Juste, and there I found it not, and after that I sayled to an other Iland called Nordeni, and sought there also, but I could not find it" (Herbal, Part 3, p. 13). Eventually Turner concluded that Pliny's herb must have been Bistort which he found "in a wode", though Pulteney quotes the later botanist Ray who felt Pliny was recommending not bistort but the great water dock to cure sea-scurvy (Pulteney, pp. 9-10). Nevertheless the whole account is a tribute to the thoroughness with which Turner pursued the task of identification. During these and later explorations he sent herbs to London apothecaries.

Although Turner had dedicated his Romyshe Foxe treatise to Henry VIII and his book on birds, Avium praecipuarum, quarum apud Plinium et Aristotelem mentio est, brevis & succinta

historia (1544), to Edward, his son, Turner's strong religious views did not find favour with his monarch. In 1546, all Turner's works, religious and botanical, were condemned and in 1547 were prohibited by a royal proclamation as "disseminating doctrines repugnant to His Majesty's views" (Facsimiles, p. 17):

> To avoide and abolish such Englishe bookes as containe pernicious and detestable erroures and heresies, 8 July, 38 Hen. VIII.... None after the last of Aug. next ensuing [1547] shall receive, take, have, or kepe in his or their possession, the text of the new testament of Tindals or Coverdals translation in Englishe, ... nor ... any maner of booke printed or written in the English tongue which be or shal be set forth, in the names of Frith, Tindal, Wickliff, Joy, Roy, Basile, Bale, Barnes, Coverdale, Tourner, Tracy or by any of them, or any other boke or bokes containing mater contrary to the Kinges Majesties booke, called, A necessary doctrine and erudition for any Christian man, etc.
>
> (quoted in Facsimiles, p. 36).

The named works of Turner were -

> 'First. A Comparison between the Old Learning and the New: translated out of Latin into English.
> 'Item. The Abridgement of Unio Dissidentium; translated out of Latin into English.
> 'Item. The Hunting of the Fox.
> 'Item. The sum of Holy Scripture.
> 'Item. The Book of Merchants, right necessary to all folks; newly made by the Lord Pantapole.
> ' Item. The Spiritual Nosegay.'
>
> (quoted in Facsimiles, pp. 36-37)

Turner finished a herbal in Latin in 1546, but as he states in the preface to Names, he deferred its printing on the advice of physicians:

> tyll I had sene those places of Englande, wherein is moste plentie of herbes, that I might in my herbal declare to the greate honoure of our countre what numbre of sovereine and strang herbes were in Englande, that were not in other nations, whose counsell I have folowed, deferryng to setout my herbal in latin, tyl that I have sene the west countrey ... which ... as I heare say is moste richely replenished wyth al kindes of straunge and wonderfull workes and giftes of nature as are stones, herbes, fishes and metalles....
> (sig. $A2^{V}$).

After Henry VIII's death, Turner returned to England and became physician and chaplain to the Lord Protector, the Duke of Somerset, at Sion House, Isleworth. Turner lived in a house in Kew on the other side of the Thames and it was here evidently, according to the Preface of the complete edition of the herbal (1568), that he conversed in Latin with the young Princess Elizabeth. Several plants in Names (which was published at this time), amongst them Cisthus (sig. C3), Malus punica (sig. E4) and Narcissus (now called a "daffodyl" sig. E6), are all described as growing in his Lord's garden "in Syon".

Raven believes that Turner sat in the House of Commons at this period, supporting his view from passages in the religious treatises. In Spirituall Physik there is a reference to his having been a burgess of the lower house and in The Huntyng of the Romyshe Wolfe the Hunter, representing Turner, says that he has been a member of the lower house for five years (English Naturalists, p. 94).

Whilst at Sion House, Turner was expecting to be made prebend of Botevant in York and was somewhat anguished at the delay, according to one of his letters to Sir William Cecil, written in 1549: "My chylder have bene fed so long with hope that they ar very leane, i wold fayne have them fatter, if it were possible" (quoted by Jackson in Facsimiles, p. 18). He was successful in obtaining the prebend which he held from 1549 to 1550. At this time he became involved in the debate about Pelagianism which denied the doctrine of original sin, asserting that the human will was capable of good without the help of divine grace. Turner wrote a tract entitled A Preservative or triacle agaynst the poyson of Pelagius (1551) which he dedicated to his old mentor, Hugh Latimer. In this work, he reminds Latimer that when he left Cambridge, Turner and the other disciples of Latimer who remained there "hadde much to do ... with them that defended praying unto sayntes, ... holye water, superfluous holy dayes, the sacrifice of the masse, ... the syngle lyvyng of ministers, and the superstitious choyse of meates: and many suche other doctrines contrary unto the scripture" (sig. $A2^{V}$). He urges the re-establishment of schools, and "livings" not only for "yonge scolars" but for "rype, and perfit" ones, too (ibid., sig. A4).

In March 1551 Turner was appointed Dean of Wells, but getting actual possession of the deanery house caused him much trouble and inconvenience according to a letter in which he writes of "being pened up in a chamber of my lorde of bathes with all my ho[ouse]holde servantes and Children as shepe in a pyndfolde.... I can not go to my booke for the crying of childer and noyse that is made in my chamber" (quoted by Jackson in Facsimiles, p. 19).

In this same year, 1551, Steven Mierdman of London printed the first part of Turner's major botanical work, under the title A new herball. Dedicating it to "the mighty and christiane Prince Edward, Duke of Summerset," Turner affirms that the acquisition of botanical knowledge is a biblical injunction:

> Although ... there be many noble and excellent artes and sciences, ... yet is there none among them all, whych is so openly commended by the verdit of any holy writer in the Bible, as is the knowledge of plantes, herbes, and trees, and of Phisick. I do not remembre, that I have red anye expressed commendation of Grammer, Logick, Philosophie, naturall or morall, Astronomie, Arithmetyke, Geometry, Cosmographie, Musycke, Perspective, or any other such lyke science. But I rede amonge the commendatyons and prayses of kyng Salomon, that he was sene in herbes shrubbes and trees, and so perfectly that he disputed wysely of them from the hyghest to the lowest, that is from the Cedre tre in mount Liban unto the Hysop that groweth furth of the wall. If the knowledge of Herbes, shrubbes, and trees, which is not the lest necessary thynge unto the knowledge of Phisicke were not greatly commendable, it shulde never have bene set among Salomon's commendacyons, and amongest the syngular giftes of God.
>
> (A new herball sig. A2)

Commenting that there are other men in England as fit as he to write a herbal, Turner says he regards his authorship as an adventure and himself as a soldier "who is more frendly unto the commonwealth" (presumably than his equally learned but more cautious contemporary botanists) and "runneth among the myddes of hys enemyes both gyvyng and takyng blowes, then he that whilse other men feight, standeth in the top of a tre, judgyng: how other men do, he beynge without the danger of gonne shot him self" (ibid. sig. $A2^{v}$). In leaving himself open to criticism by committing pen to paper, Turner confesses, "I have set one part of a great herball more boldly then wysely and with more jeopardy of my name then with profite to my purse" (A new herball, sig. A3). Forestalling any complaints that this work is "so lyttle", he promises more when his health improves sufficiently for him to travel, as he says, to "diverse shyres in England" to find out "the herbes where of I wryte, that I myght shew the readers of thys boke, in what place of England every herbe may be had and found in" (ibid. sig. A3). The work, written in English, contains the descriptions and medical uses of over a hundred and fifty plants. The names which head the descriptions are mainly in English although the alphabetical arrangement is according to the initial letter of their Latin names. There is considerable discussion as to the degree of "cold" or

"heat" of each plant and this will be discussed more fully in Chapter II.

The following year, 1552, Turner was ordained a priest with his Cambridge friend, Nicholas Ridley, officiating. But in 1553, Mary Tudor came to the English throne and the ensuing religious persecution, particularly of the Reformers, forced Turner once more into exile, and he lived in Germany. From the second part of the herbal printed by Arnold Birckman at Cologne in 1562, B.D. Jackson deduces that Turner visited amongst other places, Bonn, Chur and Frankfort, as well as living and having gardens in Cologne (Facsimiles, p. 21).

He published the religious treatise The Huntyng of the Romyshe Wolfe in about 1554 at Zurich castigating the infamies of the last years of Henry VIII's reign and suggesting reforms based on provisions for better education. A Newe Booke of Spirituall Physik, dated 1555, is a bitter denouncement of Roman Catholicism and of the rapaciousness prevalent in England, including the despoliation of Church property. Again Turner emphasises the importance of learning to redeem the situation. Meanwhile, in 1555 in England all Turner's writings had again been banned, this time by Philip and Mary, and the Wardens of every Company had to report any existing copies so that they could be destroyed (Facsimiles, p. 21).

It is interesting that about this time there was an upsurge of interest in semi-scientific books on health, and in 1557 Andrew Borde (formerly physician to Henry VIII) published his Breviary of Health, followed in 1558 by William Bullein's Government of Health. This was not Bullein's only work on the topic and according to Raven he not only lists Turner as the chief of his medical authorities in the Dialogue betweene Soarenes and Chirurgi, but in his Booke of Simples describes Turner as "a Jewell among us Englysh men as well as among the Germaynes as Conradus Gesnerus reporteth of hym for hys synguler learning, knowledge and judgement" (English Naturalists, p. 137).

Elizabeth I came to the throne in 1558 and Turner was able to return to England. John Strype records that he preached at St. Paul's on September 10th, 1559, adding, "his audience was very great (perhaps increased by his fame) consisting both of court, city and country."[10] He was reinstated to the Deanery of Wells, although Dean Goodman whom he was replacing, tried to have Turner removed and the Queen had to intervene to ensure that he "might remain in quiet possession" (quoted by Jackson in Facsimiles, p. 22).

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[10]John Strype, Annals of the Reformation, 4 vols; (1824; rptd. New York: B. Franklin, 1964), I, p. 199.

It was not to be a "quiet" possession, for Turner continued to be loud and outspoken in his protestant zeal. It would seem as if he was admired for these frank qualities by those who shared his opinions, but for some he was too strident. Raven offers three writers' assessments of his character: Strype's, that Turner was "a very facetious man" who "delivered his reproofs and counsels under witty and pleasant discourse", matches Bale's recommendation "very handsome in person and both witty and facetious, and withal a sound and elegant scholar" (English Naturalists, p. 52). But the liveliness of his personality appeared differently to Anthony à Wood who described Turner as "very conceited of his own worth, hot headed, a busy body and much addicted to the opinions of Luther" (ibid. p. 69). This last opinion seems to have been shared by Turner's superior, the Bishop of Bath and Wells, who wrote in a letter on January 24th, 1559:

> ... I am much encombred with mr Doctor Turner Deane of Welles, for his undiscrete behavior in the pulpitt: where he medleth with all matters, and unsemelie speaketh of all estates, more then is standinge withe discressyon: I have advertised him by wrytynges, and have admonished secretly by his owne frendes: notwithstandinge, he persisteth still in his follie: he contemneth utterly all Bishopps, and calleth them white coats, typpett gentlemen, with other wordes of reproche [mu]che more unsemelie and asketh, who gave them Autoritie, more over me, then I over them: eyther to forbidd me preachinge, or to depryve me:
>
> (quoted by Jackson in Facsimiles, p. 22).

Jackson recounts from Strype the story of Turner training his dog at a signal to snatch the bishop's square cap off his head (Facsimiles, p.22) Eventually in 1564, when with thirty other clergy he refused to obey the new orders as to vestments, Turner was suspended for nonconformity; he left Wells and spent the last four years of his life at Crutched Friars in London.

He was still at Wells, however, when the second and largest part of his herbal was published in 1562. Probably it was printed in Cologne to facilitate the loan of Fuchs's woodcuts with which the work is illustrated. For the first part of the herbal, it seems as if Turner had only used copies from woodcuts in Fuchs's De Historia Stirpium (English Naturalists, pp. 105-6). The second part follows the same format as the first part of the herbal but deals with far more plants, all those with Latin names starting from F through to the end of the alphabet. Attached to this work was his "booke" on English Baths - to be discussed in the next chapter - which was no doubt inspired by his travels to various watering places on the continent as much as by his nearness to Bath itself.

During his last few years in London, Turner seems to have become closely involved with a group of pharmacists and herb growers some of whom, like himself, had herb gardens. According to Stearn, one of these "was Hugh Morgan ... who was evidently responsible for the introduction of

many plants into cultivation in England" (Facsimiles, p. 8). From these practical men Turner was able to increase and verify his own knowledge, especially of English plants, so that in 1568, just before his death, he was able to publish the third and last part of the herbal, dedicated "To the right worshipfull Felowship and Companye of Surgiones of the citye of London" because it deals "most largely and plentuously of simples that belong unto Surgery" (sig. A1). It offers the identification and medical uses of English plants which Turner has not found in the classical writers. His book on wines was printed at the same time and was mostly concerned with the medical uses of wines as the next chapter will show. The third part of the herbal was incorporated into a complete edition, together with a revised first part and a reprint of the second part minus its dedication. As Raven demonstrates, the revisions to the first part (of 1551) were very thorough. There were now "long and scholarly discussions as to identification" as well as references to the opinions of contemporary botanists on the continent (English Naturalists, p. 124). The complete work is dedicated to Queen Elizabeth, reminding her of the conversation they held together in Latin "XVIII yeares ago or more" at the Duke of Somerset's when Turner was physician there (1568 edition, sig. A2-A2^{V}). Since his first herbal (presumably the Libellus) written "above thyrtye years ago"

when a fellow in Cambridge, Turner affirms that both he and the continental herbalists have learned much from each other.

This is obviously true and the results are very valuable - the first herbal in English which is not simply a compilation from earlier or contemporary continental works, but is an intelligent attempt, based where possible on first-hand experience, to provide a guide to plants for botanical or medical purposes. It is doubly unfortunate that so major a work should be printed so badly, with long lists of errata following parts one and two. After his father's death, Peter Turner apologised for these many printing errors which he found upon comparing the book with his father's "owne hande copie" but confesses that he has not had the book reprinted out of charity to the printer who would have lost money by it. He urges forbearance "with the Printer that never was much accustomed to the printing of Englishe, and afore thou reade over this booke, correct it as I have appointed and then the profite thereof will abundantly recompense thy paynes" (quoted by Jackson in Facsimiles, p. 26). As Raven comments, it is unfortunate that the son did not pursue his early attempts to produce a revised edition of his father's herbal (English Naturalists, p. 126). He obviously admired his father's work and reputation and it was to this only son that Turner left in his will "all my writen bookes and if

he be a preacher all my divinitie bookes and if he practise Phisicke all my physicke bookes" (quoted by Jackson in Facsimiles, pp. 24-25).

If one considers all Turner's English writings, he would seem to be as much physician as preacher - " A physician delighting in the study of sacred literature" as a description attached to his signature proclaims (quoted by Raven in English Naturalists, p. 122). But if one adds his Latin works on birds and the material he sent to Gesner on fishes, he becomes a field naturalist above all, and as such stands on the perimeter of modern botany. His primary aim of correctly identifying plants for medical purposes makes him a herbalist, but the length and accuracy of his descriptions, his careful comparisons of respected authors and his first-hand verifications suggest that his interest was more than that of a practising physician wishing to improve his profession's resources against disease.

Raven considers that for Turner, identification was "never an end in itself, but a means to appreciation, to the discernment of characteristics and the study of form and function, to that knowledge of the nature of things which is the preliminary to the right use and ordering of man's environment" (English Naturalists, p. 134). Turner was undoubtedly on the path to modern botanical enquiry but

he was hindered by the conventional medical theories of his day, by some facets of mediaeval herbalism and above all, by the lack of a comprehensive English botanical terminology. The following chapters will consider to what extent Turner grappled with these problems and overcame them.

CHAPTER II

TURNER'S ATTITUDES TO CONTEMPORARY SCIENCE

This chapter is concerned with Turner's attitude to some of the medical and botanical ideas current in the mid-sixteenth century. His acceptance or questioning of these ideas affected his own scientific writings, especially his herbal. (For clarity, the three parts of the herbal, published in 1551, 1562 and 1568 respectively, will be referred to as Herbal Part 1, Herbal Part 2 and Herbal Part 3 in this and the following chapters.) Assessment will be made of Turner's preference for writing in the vernacular rather than in Latin, a trend towards a humanistic nationalism which was growing not only in England, but on the continent. His attitude to the conventional medical theory of "humours" and "degrees" will be discussed, also to the old botanical doctrine of signatures and the idea of transmutation of species. There will also be some speculation as to whether his attitudes to these matters vary depending on whether he is writing as physician, naturalist or divine.

Turner's use of the vernacular.

It is not without significance that a man of Turner's learning, in the mid-sixteenth century, should choose, in addition to his translations, to write more original works in English than he did in Latin. It is of particular interest that the three parts of his herbal were written in English, since Turner must have been aware that they would have been read more widely on the continent had they been in Latin, and that his prestige among the botanists there would have risen accordingly. His writings on birds (1544), mentioned earlier, and his treatise on fishes (later incorporated by Gesner into his De Piscibus) were both in Latin; and from the Prologue to the first part of his herbal it would seem that his main concern is that Englishmen, like their European counterparts, should be bold enough to put their botanical knowledge into a written form, Latin or English:

> There have bene in England, and there are now also certain learned men: whych have as muche knowledge in herbes, yea, and more then diverse Italianes and Germanes, whyche have set furth in prynte Herballes and bokes of simples. I mean of Doctor Clement, Doctor Wendy, and Doctor Owen, Doctor Wotton, and maister Falconer. Yet hath none of al these, set furth any thyng, ether to the generall profit of hole Christendome in Latin, and to the honor of thys realme, nether in Englysh to the proper profit of their naturall countre.
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> (Herbal Part 1, sig. $A2^{V}$).

Foreseeing opposition to his own herbal being in English on the grounds that "... every man, nay every old wyfe will presume not without the mordre of many, to practyse Physick" (ibid. $A3^{V}$), Turner queries how many English surgeons and apothecaries can understand the Latin of Pliny or the Greek of Galen and Dioscorides. Yet to a large extent the English physicians depend on the apothecaries who in turn must rely on "the olde wyves, that gather herbes" (ibid. $A3^{V}$). This system of partial knowledge, he argues, puts "many a good man by ignorance in jeopardy of his life, or marreth good medicines ... when as by havying an herball in English all these evelles myght be avoyded" (ibid. $A3^{V}$). The ancient writers wrote in their own languages without hindering the study of liberal science and so, Turner triumphantly concludes "am I no hynderer wryting unto the English my countremen, an Englysh herball" (ibid. $A3^{V}$).

In defending his use of English, Turner gives an important clue to his own character and his success as an independent thinker. He wishes people to read and reason for themselves, without the help of intermediaries. This is very closely linked with his Protestant faith and with his dislike of English folk bowing to Papal authority. As Raven points out in <u>English Naturalists</u> (pp. 110-111), Turner is never backward in attacking the Catholics for

what he considers their tyranny and superstition and for robbing people of opportunities for improvement. His religious treatises are full of such attacks. For example, in The huntyng and fyndyng out of the Romyshe foxe Turner suggests that the continued use of Latin in the churches is political rather than religious:

> The pope willeth and commandeth in all places where he hath domynacion that all Psalmes and all masses shall be sayde and sunge in hys olde mothers Latin tonge thoughe the people understande never one worde of the Latyn tonge, yet thys doth he in a token that the people hearynge the Romyshe tonge, whiche is Latin, shulde knowledge themselves to be under the See of Rome, ye Chrysten in the popes tonge and bury in the popes mother tonge and synge all the Psalmes that are songe, in the popes mother tonge and command straytely that all the thynges above rehersed shall be sayd, songe and done in no other tonge but in the popes mother tonge which is the Latyn tonge, in a token that ye swarve not awaye from the pope of Rome.[1]

He then goes on to explain how other nations which have broken away from Rome hold their services, songs and psalms in their own languages and he quotes from St. Paul about the importance of speaking to men in their own language. Later on in this same tract of the Romyshe foxe, Turner recounts the tale of the man put to death for reading the Bible in English, and he accuses the clergy:

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[1]William Turner, The huntyng and fyndyng out of the Romyshe foxe (Basle, 1543), S.T.C. 24354, sig. C1-C1^{v}.

> to rede the Gospel of Jesu Christ in the Englyshe tonge that seven or eyght may heare, is rekened of you the develles servise.
>
> (ibid. C4^{v})

The vituperative tone of these extracts may be Protestant, but a later paragraph suggests that beneath the religious fervour is a basic attitude to learning:

> the lay men maye have myche more profyt of hearynge of fyve wordes red in Englysh, that they understand, then of V thousand wordes that they do not understande, be they never so fynely chopped champed or chanted.
>
> (ibid. C6-C6^{v})

He belabours the same theme in A new booke of spirituall Physik extolling the virtues of King Lucius "the fyrst christian kynge of our lande" who "caused many bookes of latin to be translated into hys owne naturall tonge."[2]

This emphasis on reading and understanding for oneself permeates all Turner's works, religious and scientific. He makes it clear that he writes in English so that he can be understood by his own countrymen, not excluding those of his own birthplace, Northumberland. Even the title to his English translation of The Cathechisme, or maner to teach children and others the Christian fayth states that it is "Easely to be understanded and read as well of the people of the North Country, as others" (quoted

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[2]William Turner, A new booke of spirituall Physik (Rome, 1555), S.T.C. 24361, Fol. 32^{v}.

in Facsimiles, p. 33). One is tempted to speculate about the dialectical difficulties of these Northerners, surely still not as great as suggested in Ranulph Higden's Polychronicon, in John Trevisa's translation: "Al the longage of the Northumbres, and specialliche at York, is so scharp, slitting, and frotynge [harsh-sounding] and unschape [ill-formed], that we southerne men may that longage unnethe understonde."[3] Certainly whatever their differences in the mid-fifteen hundreds, this son of Northern soil is ever anxious to include them as readers of his work.

Obviously reading in one's own tongue is an important step towards being responsible for one's own learning rather than accepting knowledge through the medium of a teacher or clergyman. This is not to say that Turner did not respect an authority which he felt to have been rightfully earned. Indeed, Raven in English Naturalists feels that Turner had no wish to rebel against tradition, but wished "to reaffirm and defend a yet more ancient wisdom.... His primary intention was to interpret the true meaning of the past: to learn what St. Paul and the Gospels had to say about Christianity, or Aristotle and

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[3]Ranulph Higden, Polychronicon, trans. John Trevisa, in Rerum Britannicarum Medii Ævi Scriptores or Chronicles & Memorials of Great Britain & Ireland during The Middle Ages, ed. Churchill Babington (1869; rpt. New York: Kraus, 1964), II, 163.

Pliny about ornithology, or Theophrastus and Dioscorides about herbs" (p. 57). References to Dioscorides, and to Galen - naming the most revered - occur over and over again in the herbal and in the book of wines. Galen, with other old authorities as well as some contemporary with Turner, is quoted extensively in his book on baths. Galen was accepted without question by most learned men, especially physicians, of Turner's day. Raven quotes the case of a Dr. John Geynes who in 1559 was charged by the College of Physicians for imputing errors to Galen. To some extent Turner accepts the opinions of the greatest ancient botanists such as Dioscorides on trust, except when they conflict with the results of his own experience and personal investigation. Even then, in the case of plants, Turner is quick to recognise that variations may occur with changes of locality and therefore two differing descriptions may be equally correct. On the whole he accepts the writing of botanists or other early scientists, such as Avicenna, when it is obvious that such writings are the result of personal investigation and experiment. Such pronouncements may then be used as a yardstick against which to measure his own findings. When they concur, Turner accepts the results as a scientific fact, and in the case of plants may go on to use this as the basis for medical advice.

Turner's attitude to authorities, as exemplified by the doctrines of degrees and humours.

Turner learned the theory of degrees from Galen, as we may deduce from the first herb, Saucealone, in the third part of his herbal in 1568. Under the heading, "The complexion and vertues of this herbe", he describes it as: "hote at the lest in the ende of the second degre after the rules of Galene, who teacheth us to judge of the hete and coldnes of herbes, by the tast of the tong" (Herbal Part 3, p. 1). Earlier in his introduction to Part 3 of the herbal, having explained that the forthcoming section "intreateth most largely and plenteously of simples that belong unto Surgery" (ibid. [A]2), Turner proceeds to define the term "degree" on the grounds that it "is as littell understanded as it is greatlye occupied in al mennis mouthes" (ibid. [A]2^{V}). Explaining how "degree" is "gradus" in Latin, from "gradior", "to go"; and "apostasis" in Greek, meaning "a standinge or going away from" (ibid. [A]2^{V}), Turner further elucidates how certain herbs are temperate, or fall midway between hot and cold (later he gives some examples, including Sperage and lentils).

> And if any herbe departe from the temporate herbes toward heat, and is sensible felt a littel hote, it is called hote in the first degre, and if it be a littel hoter, it is called hote in the second degree, as though it had made two steppes or departinges from temperate (ibid. [A]2^{V}).

Reading this today, one feels the imprecision of "a littel" though Turner further on clarifies those that are hot in the first degree in that they "encrease the natural heate whiche commeth after the digestion" (ibid. [A]2^{V}), giving many examples including aloes, green dill, chestnuts and rice. Capers, basil, salt and more than twenty others, he declares to be hot in the second degree and "partakers of a fyrye heate" thus having "power to make suttel or fine, and to open the stoppinge of the poores and other wayes" (ibid. [A]2^{V}). Hot in the third degree means "very hote", and "if they be taken in they cut in peces [violently irritate the gut?], they draw, they heate verye muche and make a man thirstie" (ibid. [A]3). Cloves, pepper and radish come into this category, together with many less well known. Of those herbs as hot as they can be, and therefore hot in the fourth degree, these "rayse by bladders, burne and pul of the skin and frete inward" (ibid. [A]3). Only eleven herbs make up this group, which includes garlic, onions, and mustard.

Similarly, those that are cold in the first degree (i.e. "but a littel cold") cool the natural heat and tend to hinder digestion; those cold in the second degree "make thicke or grosse and evidentlye make dull or minish the natural heate" (ibid. [A]3^{V}); those cold in the third degree "stoppe and shyte by the inwarde wayes and passages

and the pores. They make dull all the wittes or senses" (ibid. [A]3^{V}). The three medicines cold in the fourth degree - "cicuta", "the juice of black poppye called Opium" and "Blacke poppye" - "frese together or congele, put out or quenche the natural heate, and kill men if they take them in anye great quantitie" (ibid. [A]3^{V}).

After this follows an account of "herbes and other thinges" that are moist or dry in varying degrees, and then of "medicines" that have combined qualities, that is, are cold and dry, cold and moist, or hot and moist in varying degrees. There are many repetitions here of plants previously referred to as having just one property. For example, "the gourde" had been listed previously as being cold in the second degree, as had "Cucumbers" and "Melones" amongst other plants. Under the heading of medicines cold and moist in the second degree, are listed "Melones, Cucumbers, ... Great Melones beyng greene" (ibid. [A]4); medicines that are simply cold in the fourth degree, as stated previously, are "cicuta", "the juice of black poppye called Opium" and "Blacke poppye" (ibid. [A]3^{V}). Those that are cold and dry in the fourth degree include "Poppye, The juice of blacke poppye, Horned poppye, The Methel nut called Nux methel" (ibid. [A]4). There are obvious overlappings here.

Turner follows Galen scrupulously in believing that such classification is based on a plant's relationship to one that is temperate. Designating those which are temperate might seem to be somewhat arbitrary decisions on the part of botanists even if one considers it in the much larger context of the doctrine of humours, which in turn goes back to Hippocrates' theory of the four elements - earth, air, fire, and water. Allied to the four elements were the four primary qualities - heat, cold, dryness and humidity. Two of these qualities were ascribed to each element - fire being hot and dry, air hot and moist, earth cold and dry, water cold and moist. The transmutation of elements came about through substitution of qualities. Thus "dried water becomes earth, heated water becomes air, but to transform water to fire it must be both heated and dried."[4]

From about the time of the Greek Empedocles, it was believed that man's body contained four fluids, corresponding to the four above-mentioned elements, and that these bodily fluids were formed from food after digestion. Blood was hot and moist, like air; phlegm was cold and moist, like water; choler, or yellow bile, was hot and dry, like fire; melancholy, or black bile, was cold and dry like the earth. Thus, each of these bodily fluids, later called "humours",

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[4]A. Rupert Hall, The Scientific Revolution 1500-1800: the Formation of the Modern Scientific Attitude (London: Longmans, Green, 1954), p. 26.

matched the four basic human temperaments - the phlegmatic, the choleric, the sanguine and the melancholic.[5] Each man's natural personality was thought to be determined by which "humour" was, to a greater or lesser extent, in excess of the others. Thus, the "balance" of humours would vary from one person to another, even when each was in a state of good health. Disease, however, was thought to be caused by the unnatural excess of some humour, or by unnatural humours, brought about by "burning" or "adustion".

According to Sanford V. Larkey and Thomas Pyles in their introduction to An Herbal (1525) (an anonymous compilation, much slighter and less scientific than Turner's herbal, and popularly known as Banckes's Herbal from the printer's colophon) there were many varieties of these unnatural humours, but they invariably produced "an unnatural melancholic humour"[6] which was not to be confused with a normal melancholic disposition.

By the end of the sixteenth century the term became a convention indicating a particular personality trait in literary characters. Often such a trait or disposition had

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[5]A. Rupert Hall and Marie Boas Hall, A Brief History of Science (Toronto: New American Library of Canada, 1964), p. 111.

[6]An Herbal (1525), eds. Sanford V. Larkey and Thomas Pyles (New York: Scholars' Facsimiles and Reprints, 1941), p. xxi.

no apparent grounds; it was a predisposition in a person which circumstances revealed and emphasized. In the hands of lesser dramatists, this resulted in character types, but Ben Jonson used the convention in his plays Every Man in His Humour, Every Man out of His Humour, Cynthia's Revels and The Poetaster to reveal fine psychological insight. In the Induction to Every Man Out of His Humour Jonson gives a definition of "humour":

> Asper: Why, Humour (as 'tis ens) we thus define it
> To be a quality of air or water,
> And in itself holds these two properties,
> Moisture, and fluxure: as, for demonstration,
> Pour water on this floor, 'twill wet and run:
> Likewise the air (forc'd through a horn, or trumpet)
> Flows instantly away, and leaves behind
> A kind of dew; and hence we do conclude,
> That whatsoe'er hath fluxure, and humidity
> As wanting power to contain itself,
> Is Humour. So in every human body
> The choler, melancholy, phlegm, and blood,
> By reason that they flow continually
> In some one part, and are not continent,
> Receive the name of Humours. Now thus far
> It may, by Metaphor, apply itself
> Unto the general disposition:
> As when some one peculiar quality
> Doth so possess a man, that it doth draw
> All his affects, his spirits, and his powers,
> In their confluctions, all to run one way,
> This may be truly said to be a Humour.[7]

In Jonson's better known play, Every Man In His Humour, the definition is demonstrated very well in the character of

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[7]Quoted in the introduction to Ben Jonson, Every Man in His Humour 1598, ed. Martin Seymour-Smith (London: Benn, 1966), p. xix.

Kitely, a compulsive neurotic riddled with a jealous "humour". His portrayal exhibits some keen psychological touches at a period when medically speaking, the humours theory was starting to lose ground.

In Turner's time, almost half a century earlier, where a disease was considered to be an excess of a humour, the physician's aim was to deplete that humour "by diet or by direct purgation of the humour involved."[8] Nature often achieved this naturally by some form of discharge (such as that from the nose or an abscess) or haemorrhaging, but nature could be helped by the administration of suitable herbal remedies. For the sick body to return to healthy balance, the physician's treatment aimed at generating qualities opposing those associated with the existing disease, and therefore herbs were graded according to their heating or cooling properties. This theory is expressed in the introduction to The grete herball which was printed in England in 1526, a translation of the French herbal, Le grand Herbier:

> ... Consyderynge the cours and nature of the foure elementes and qualytees where to the nature of man is inclyned, out of the whiche elementes issueth dyvers qualytees infyrmytees and dyseases in the corporate body of man, but god of his goodnesse that is creatour of all thynges hath ordeyned for mankynde, whiche he hath created to his owne lykenesse, for the grete and tender love, which he hath unto hym to whom al thynges erthely he hath ordeyned to be obeysant, for the sustentacion and helthe of his lovynge creature mankynde whiche is onely made egally of the foure elementes and qualitees of the same, and whan any of these foure habounde or hath more domynacyon, the one than the other than it constrayneth the body of man to grete infyrmytees or dyseases, for the whiche the eternall

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[8]Hall and Hall, A Brief History of Science, p. 112.

> god hath gyven of his haboundante grace, vertues in all maner of herbes to cure and heale all maner of sekenesses or infirmytees to him befallyng thrugh the influent course of the foure elementes beforesayd, and of the corrupcyons and the venymous ayres contrarye the helthe of man Also of unholsam meates or drynkes, or holsam meates or drynkes taken untemperatly whiche be called surfetes that brengeth a man sone to grete dyseases or sekenesse, ... Wherfore brotherly love compelleth me to wryte thrugh the gyftes of the holy gost shewynge and enformynge how man may be holpen with grene herbes of the gardyn and wedys of the feldys as well as by costly receptes of the potycarys prepayred. Also it is to be understande that all maner of mydicins that be contrary to sekenesses is for the grete superfluyte of the humours or the dymynucyon of them, or for to restrayne the cours where it is agaynst the feblenesse of the vertues for the alteracyon or solucyon of contynuetes or woundes or other begynnynges.[9]

If, then, medicinal herbs are efficacious according to their contrariness to the humour causing the disease, and furthermore, if (as previously quoted from Banckes's Herbal) unnatural humours tended to produce "an unnatural melancholic humour", it is not surprising that the majority of herbs recommended as useful fall into the category of "hot and dry". One might examine, for instance, those plants mentioned in the third part of Turner's herbal, simply on the basis of their suggested medicinal value. The third part is probably the most significant in this latter respect, being dedicated to "the right worshipfull Felowship and Company of Surgiones of the citye of London" and concerning itself, as Turner

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[9] The grete herball (London, 1526), S.T.C. 13176, sig. A2.

says in the introduction "most largely and plenteously of simples that belong unto Surgery" (sig. [A]2).

A perusal of this indicates that the "hot and dry" herbs, of which there are many, combat those illnesses arising from cold causes. In this sense one might consider Cloves, described as "almost hote in the thirde degre" to be a basic remedy, being "generallye good against all cold diseases" including a "colde stomake" and a "cold reumatike brayne" (Herbal Part 3, p. 23). Similarly Angelica, "hote and drye at the lest in the third degree" as well as being a preventative against the pestilence or plague, is also "good for gnawing and payne of the bellye that commeth with cold" (ibid., p. 6). Pillitorie of Spayne, "hote at the leaste in the third degre," in addition to being good for the colic, "helpeth barunes of weomen if it come of a colde cause" (ibid., p. 37). Stronger still presumably, since it is hot and dry in the fourth degree, is the Hartnut which "is good for al diseases of the brayne that come of colde and moystenes." So extreme is its heat that "it is deadly jeperdous for yong men, and for them that be of a colerike or hote complexion" (ibid., p. 51), seeming to indicate that people are more likely to be hot-tempered in their youth than in later life!

All these herbs seem to be consistent with the basic premise of hot and dry herbs healing illnesses associated

with cold, always presuming these illnesses can be accurately diagnosed as "of a cold cause." Does this imply that the patient feels cold to himself in the affected part, or that he feels cold to the physician? Or is it the result of a chill? Similarly the "dry" aspect of "hot and dry" performs a binding function on various bodily discharges. Thus, the hot and dry Mouseeare "is exceding good to glewe woundes together" (ibid., p. 58), and Wintergrene's binding property not only "healeth wonderfullye in short space grene woundes" but the leaves and seed are both "good for bloodye flixes" (ibid., p. 60). Again the herb Two pennies (so called because of its small paired round leaves which resemble pennies), being binding and drying, also is good for "the bloodye flixe and for over-muche flowynge of weomens humores" (ibid., p. 55).

However, the rationale breaks down somewhat on our learning that wounds and "the bloodye and white issue of weomen" respond well to applications of Lunarye which, says Turner, "is reckened to be of a colde and drye nature" (ibid., p. 53; my italics). Turner here seems not to be speaking from first-hand experience. Whereas he says of the properties of Angelica "I have not proved them al as yet my selfe, but divers of them I have proved and found to be true" (ibid., p. 6), Turner makes no such claims for Lunarye, but prefaces the virtues with "The Italianes

write ...". There is no real indication, however, that the use of the word "rekened" in the sentence "It is rekened to be of a colde and drye nature" is anything other than cautious rather than sceptical.

Presumably then, the heat or coldness does not affect the drying or binding properties of a herb. Tamarinds, like Lunary, are cold and dry, but in this case the coldness, rather than the dryness, seems to be the dominant medicinal factor. Although this fruit, being cold and dry in the second degree, "hurteth a cold stomache" yet it will "scoure away choler and hold doune the rage of it and the heat of the blood" (ibid., p. 73). Nor is one surprised to find it recommended for "al kindes of burninges." (Turner is obviously speaking from first hand experience here because he says "I have purged some weike bodyes with an halfe unce.") Similar success may be had with Emblikes Mirobalanes ("somthinge colde and drye") which "slake the notable heat of the bowelles" and in the stronger form of Bellerick Mirobalanes which "purge choler" (ibid., p. 47). This latter, says Turner, is according to Averroes, the Arabian physician of the twelfth century.

Considering then, that these "choler purging" herbs are all cold and dry, it comes as something of a surprise to read about Cassia fistula. "Cassia is a litle hote and moyst in the first degre. It purgeth from the stomacke choler and fleme gently by soughtning of the belly. It is

good for agues that rise from those two humores, and by this meanes it clenseth the blood, and quencheth and dulleth the sharpnes both of blood and coler" (ibid., p. 21). Here is a warm herb, though not indeed a very warm one, purging choler. Turner is obviously speaking from personal experience about the medicinal properties of this plant, for he later cautions: "I knowe in my time two of my pacientes to whome Cassia was a poison for assone as ever they take it, they were verye sore seke and eche of them at the least had xl. stooles, the one was a gentle man of Freseland the Jonker of Aldersham and the other a gentle man of England" (ibid., p. 21). Is one to deduce from this that purging with a warm herb might be more risky than purging with a cold one?

Melancholy and choler would seem to be somewhat opposing humours. Whilst both were dry, the former was cold, the latter hot. Yet the herb, Sene, according to Turner, is good for both.

> The Sene coddes are hote in the beginninge of the second degre and drye in the first. And the leaves are hote in the firste degre. Sene scoureth awaye and purgeth awaye gentlye melancholye and burnt choler from the braine, from the sensible partes ... and therefore it is good for diseases that springe of the humores of those places as are melancholike and olde agues (ibid., p. 71).

Presumably the choler has changed its nature somewhat in the process of becoming "burnt" and has thus induced a more

melancholic disposition. This would agree with the explanation of "burning" offered by Sanford and Pyles and referred to earlier in this chapter. In closing his comments on Sene, Turner adds that "some late writers" recommend this herb for purging phlegm. This would seem to make it something of an all-purpose medicine, if it were effective against three humours out of four!

What becomes increasingly difficult at this distance in time is to establish a firm theory behind the medicinal uses of the herbs, if one exists at all. As soon as one builds a fairly consistent pattern, it is broken by a series of exceptions. It is obvious that medicinal theory and practice in the sixteenth century were much more complex than determining the degree of heat or coldness of a herb, then prescribing it for an illness arising from a contrary (as regards temperature) cause. Nor does it make it easier that different parts of a plant are often rated differently as to the degree of heat, or lack of heat, they possess. In the case of Sene the coddes or seed cases are obviously slightly hotter than the leaves. Sometimes Turner expressly points out when two parts of a plant have the same degree of heat or coldness, especially if it is rather extreme. For example, in the case of Duch Pimpinell, he says "The herbe is hote at the lest in the third degre both the roote and the sede" (ibid., p. 11).

Fortunately, however, few plants are as complex in their properties as Rhubarb which is described as having a "duble substance" because "the erthlynes is depe in and the fyrishnes is in the outward parte" (ibid., p. 65). One is advised therefore to steep it before using so that the "hote and purging may be removed in the licor and the erthly and binding property abide behinde" (Herbal Part 3, p. 65). Presumably then, it is the liquor which purges away choler and phlegm from the stomach, and the binding or earthly decoction which "stoppeth the spittinge out of blood," though Turner after advising the separation of the parts of rhubarb, does not in fact differentiate between their uses in his subsequent advice, even though the advice is very specific and expresses his own opinion against that of Defue, whom he is quoting. For example, we read "it heleth places brused by fallinge ... if one dram be taken with two greines of mummia and one greyne and halfe of madder sayth Defue, but I wold advise to take at the least half a dram or two scruples for this mesure is a great deale to litle, it must be taken with tart or binding wine" (ibid., my italics). And later Turner again disagrees with the writer from whom he is quoting:

> It is also good for agues that come about by courses. The infusion of one dram and an halfe or thre drammes is sufficient. It may be taken in pouder from one dram to thre as Defue sayth, but I would not advise English men gladly to

> excede two drammes in pouder and I would geve foure drammes in the infusion rather than two and halfe in pouder
>
> (ibid., p. 65).

This constant measuring of given facts against facts gained from personal experience is an important trend in the sixteenth-century development of scientific thought and expression, and Turner was an early and ardent exponent of the method in botany. However, he pursues the critical course within the framework of conventional scientific theory as far as the matter of degrees and humours is concerned, and therefore his testing does not have the validity which his thoroughness should indicate. Taste and smell have always defied precise measurement and thus the basic hypothesis of degrees is subjective rather than objective. There seems to be no evidence that he refutes the old Galenic theory, only that he disagrees with its mode of application in those cases where his own experience suggests a different one.

This attitude is shown very well in his dealing with Guiacum, otherwise called Diet wood, which says Turner "by the reason of his rosin withstandeth putrefaction or rottennes of humores in the bodye" (ibid., p. 34). Evidently this was made into a common health cordial as well as into a medicine and Turner cautions against making the former too strong "for when we geve manye medicines then we intende to alter muche and chaunge the humore." He advises

that when taken with a meal it should be drunk before one starts to eat, because "it that is taken after meat marreth the meat, and can not for the meat come to the convenient places whether it should come, and oft goeth up to the heade and troubleth it very sore" (ibid., p. 35).

Overall on the matter of humours, Turner is usually a traditionalist, supporting the opinion of an ancient writer against that of one of his contemporaries. Even such a famed botanist as the German Jerome Bock invites Turner's criticism in a consideration of the virtues of Golden rod. Wounds, fistulas, kidney stones, mouth sores, and crooked teeth are only a few of the distresses for which this herb is recommended, but Turner is firm in expressing his idea of the form in which it should be used. "Hierom Bock geveth almost all the fornamed vertues" (i.e. healing qualities) "unto the distilled water of the herbe and sayth also that it is good for the stomach and mother ... But I set more by the juice, broth, and pouder of the herbes then I do by their waters" (ibid., p. 79).

It would seem as if Turner, confident in his Latin and Greek and thus armed with an intimate knowledge of the classical botanists, prefers to verify their findings himself, than to set too much store by the opinions of continental contemporaries, however illustrious. In this he must surely be judged somewhat modern, for such a

confidence in the fruits of one's own experience required some temerity in print, at the time Turner was writing. His comment on the root Setival sums up the matter:

> I have not yet spoken with anye man, nether rede any mannis booke of this age, that hath sene Setival grene, wherefore we can not describe it. But because we have the roote, we can judge somthinge of it both by taste and the workinge of it, and by bokes of elder writers that have written of it
> (ibid., p. 79).

In this latter sentence lies his creed. It is repeated, albeit in a negative way, when he says of Rosa folis

> Our English men now adayes set very muche by it, and holde that it is good for consumptions and swouning and faintnes of the harte, but I have no sure experience of this, nether have I red of anye olde writer what vertues it hath, wherefore I dare promise nothing of it
> (ibid., p. 79).

From the herbal then, it would seem as if the classical writers, especially Galen and Dioscorides, were Turner's first authorities; his own practical experience a second authority; and the opinions of contemporary writers for whom he had respect (such as Gesner) formed a third authority. The two other scientific books, A new Boke of the natures and properties of all Wines and A Booke of the natures and properties, as well of the bathes in England as of other bathes in Germany and Italy would seem to bear this out, with a few interesting exceptions.

In the Epistle to the book of wines Turner offers as the purpose of his book to "confute the errors and ill opinions that all men have concerning the natures and properties of them."[10] Such ill opinions, Turner says, are due to people "not being armed with learning, authoritie and reason" (ibid. A3). Very early in the book itself, he proceeds to establish an exactness for the terms "old wine" and "new wine" according to Galen, Dioscorides, Pliny and Valeriola, pointing out that the latter writer, though "otherwise wel learned" (ibid. B2^{v}) disagrees with Galen's law in using the terms "old" and "new" according to the taste and appearance of the wine rather than to its age in years. Whether the French wines of Valeriola lost their astringency and gained clarity (that is matured) more quickly than the wines of the old writers would be hard to prove, yet when we read Galen's definitions "wine (that is to say of midle age) is hote in the seconde degree, but it that is verie olde is hote in the third degree" (ibid. B3) we know from Turner's introduction to the third part of his herbal that by "degree" he means graduations in taste from the temperate. Therefore for Galen to wait for ten years to term a wine "old" and Valeriola to wait less than

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[10]William Turner, A new Boke of the natures and properties of all Wines (London, 1568), S.T.C. 24360, sig. [A]3.

a year, suggests either very different grapes, a different maturation rate or a less sensitive palate!

Having noted this difference of opinion, Turner moves on to Aristotle who averred that kidney stones could be caused by the "earth or earthlynesse" (ibid. B4) in new wine. Turner supports this with his own recollections, from his stay in Germany, of three people dying from drinking "new Rhenishe wine." Since he describes their symptoms as paralysis of the limbs and loss of speech, one might presume that these wines, instead of starting to ferment naturally, had somehow been tainted with a "wild" yeast. Thus the grape juice, instead of fermenting to the familiar alcohol ethanol, might be changing instead to the very poisonous methanol, which causes paralysis when drunk.

The natural maturation of wine would agree well with the theory of humours as these writers applied it. Very new wine before starting to mature would be astringent in the mouth but produce no sense of heat when swallowed. The natural maturation process would ensure that older wine, having lost some astringency through chemical processes, would be smoother and more warming when swallowed. And finally, a very mature wine might give still more heat, not only because of the alcohol, but because of other components, such as ketones and esters, which develop in very old wines.

Since this chemical analysis was not known in the sixteenth century, we cannot blame Turner for accepting taste and alcoholic sensation as proof of the humours doctrine. However, it is not so easy to follow and agree with his argument when he specifically applies the theory to the formation of kidney stones. "Although", Turner writes that, "the naturall disposition that a man hath of his father or mother to the stone be a great and unavoydable cause of the stone" (ibid. $B6^{V}$), he goes on to cite two other causes which he terms the material and the efficient. The former is the eating of foods hard to digest such as old cheese and "meates of grosse juice" which cause raw humours to form in the body. When this undigested matter meets with "a fierie heate" in the kidneys and the bladder then there is danger of hard stones being formed. Therefore, medicine or wine given to aid digestion must not be so hot that in cutting "grosse humors in pieces" (ibid. B7), it also heats "out of measure" thus forming ill humours from the drying up of hitherto healthy matter, which in turn causes kidney stones. The value of a wine is in its ability to drive raw or ill humours out of the body, and this is the property which Turner is extolling in Rhennish and white wines, that they do not leave the humours "sticking fast" but "they drive them quite thorow all the water vesselles into the chamber pot or urinall" (ibid. $C8^{V}$). He quotes

from Galen, Aetius and Actuarius to corroborate his opinion that white wines, being not so hot as red wines, but "thin and waterish, and gently binding", are not only harmless to the head, but may because of this lightly binding quality, ease slight headaches caused by "humours gathered togither in the stomach" (ibid. C4). However, this Rhennish wine must not be too new, for "whilst it is yet as thicke as puddle or horsepisse" (ibid. B4), that earthiness (or the dregs) still in it would be material cause for the stone.

Thus Turner confounds those of his contemporary physicians (whom he terms sophisters) who, he says, are forbidding their patients these white wines he recommends. In fact, if a man eats moderately, and a balanced diet, Turner says, and goes "downe at convenient times to the stoole" (ibid. D2^{v}), then these small white wines "scoure and drive out the uncleannesse of the bodie" (ibid. D2).

There would seem to be something of a discrepancy here in that the small white wines are extolled on the one hand for their "scouring" property and on the other hand for being "lightly binding." It may be that the latter is used in the sense of only lightly binding, in comparison with the more harmful black wines which "are grosse and thicke, and are binding, tarie and abide long in the bellie" (Wines, C6). Or it may be that Turner did not consider his

white wines to be even as binding as those of Galen. Turner obviously recognises variability in wines of different regions when, in the section on the nature and properties of white wine, he translates and explains Galen as follows: "That is, ye can finde none of the white wines that is hote, meaning of the common white wines that were about where as he dwelt" (ibid. C3). To some extent, Turner is caught again in the imprecision of the terminology.

At no time in his work does Turner allude to contemporary physicians or writers to support his argument. However, in the book on baths and their medicinal virtues, he names in his preface twenty-six "lerned men" of whom the majority are sixteenth-century writers in Germany and Italy. Perhaps the best known today are the Germans Leonhart Fuchs and Conrad Gesner, and the Italian, Savonarola. However, he refers also to the classical writers Galen, Aetius and Aristotle.

As with wines, the composition and properties of the baths are determined by sensory impressions which defy precise measurement, and though Galen is not named directly, his influence is felt on the first page when Turner declares brimstone (now called sulphur) to be the main component of the waters at Bath in England. "I went in to them my selfe wyth my patiente and broughte furth of the place nexte unto the spring and out of the

bottom slyme, mudde, bones and stones, whyche alltogether smelled evidentlye of brimstone."[11] He is fully confident in the Galenic tradition: "brimstone beareth the chefe rule, seynge that nether by smellinge nor tastinge a man can fele no other mater or miner [mineral] to reigne there" (ibid., p. 1). There is no suggestion that the brimstone may overlay and disguise the smell of other more medicinally important ingredients. However, from walking around the hills from which the water sprang, Turner confesses that "I founde here and there litle peces of marquesites and stones menged with copper" (ibid., p. 1), but he concludes that there could be no "notable qualite" of it in the baths since he could "by no sense or wit" perceive it.

Writing later in the book of a "Soure bathe" on the continent, he refers to Fuchs: "Fuchsius sayeth, that there is som brimstone in it, but nether he nether anye other wryter that I can rede of, sheweth anye other miner or matter whyche gyveth thys soure taste in to the water" (ibid. fol. 4^{v}). He confesses that he himself cannot honestly say what the mixture is, not having visited the baths, but guesses it to be Alum "whych in other bathes,

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[11]William Turner, A Booke of the natures and properties, as well of the bathes in England as of other bathes in Germany and Italy (Cologne, 1562), S.T.C. 24366, p. 1.

where it is much, geveth such a tast unto them" (ibid. fol. 4^{V}).

Concerning a bath five miles from the Italian city of Padua, Turner is translating Savonarola. Savonarola himself harks right back to Aristotle's book on the properties of the Elements, from which, presumably, the Galenic principle took root. According to the ancient Greek, the vein of a bath may be known "by the coloure and by the tast." However, more senses are brought into play to determine the constituents of this bath, the chief of which are decreed as salt and alum. There is also some brimstone because there "may by sight be well perceyved som deale of ashes." But that brimstone is not so predominant as in some baths is known by touch as well as colour - "brimstone should have much clammines, and should have more of the yelowe colour" (ibid. fol. 7^{V}).

The bath considered after this is the Calderane bath near Verona, and Turner quotes Bolderius, a native of that city who has evidently done a quantitative analysis of the water finding that "ten partes, have VIII. and a halfe of yron, one parte of naturall salpeter, and halfe a parte of brimstone" (ibid. fol. 9). Although no mention is made as to how he achieves these figures, the small quantity of brimstone compared with iron seems to be responsible for this bath being described as "measurablye

cool and notably drye" (ibid. fol 9).

It is interesting that all the eleven baths mentioned are considered by Turner and the writers whom he quotes to have some brimstone, and eight of them to have alum also, though there is not always agreement as to the quantities of either. Salt or saltpetre are also named as being constituents of eight of the baths, though not exactly the same ones as those which have the alum. Iron, gold and copper are each mentioned in connection with only one or, at the most, two baths.

Alum, of course, had been known long before Turner's time. It is obvious from Avicenna's Canon of Medicine, written early in the eleventh century, that Arabian scientists knew how to prepare saline substances, including alum. Albertus Magnus, a scientific monk writing a century later, mentions cream of tartar, alum, red lead and liver of sulphur.[12] Sulphur had been considered long before this to be one of the chief constituents of all metals. Writings by Geber, in the eighth century, suggested that metals were compounds of sulphur and mercury, one metal differing from another because of the varying proportions and purity of these two "elements."

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[12]Edward Thorpe, History of Chemistry (London: Watts, 1921), p. 31.

This idea existed in some form throughout the Middle Ages, with the mercury supposedly conferring metallic properties (such as lustre and malleability) to a metal, and the sulphur being responsible for the combustibility or alterability of the metal by fire (Thorpe, p. 24). This "inflamatory" property of sulphur ensured its inclusion in many alchemy experiments, valid and otherwise. Roger Bacon, scientist and reputable alchemist, in De Secretis Artis et Naturae offered in the thirteenth century an experiment which has since been interpreted as saying that "'7 parts of saltpetre, 5 of young hazelwood and 5 of sulphur mixed' will produce a thundering noise and a bright flash" (Thorpe, p. 32).

It is obvious then, that in writing of brimstone (sulphur), alum and salt or saltpeter, Turner was following a long tradition of interest in these particular "elements". In particular, the combustible property of sulphur had excited alchemists, or early scientists, for centuries.

It would seem quite logical, therefore, for the obvious heat of all those baths containing brimstone, to be recommended for the healing of those diseases arising from "moist causes." Thus, the White Bath (Weissbaden in Dutch) which has waters hot enough to "scald hennes and pigges and seth egges" and is therefore "verye evel for them that are cholerik and of an hote complexion", is recommended to

"heate muche membres that are foundre or fretished wyth colde and bringe them to theyr naturall heate agayne" (Baths fol. 3-3^{V}). Similarly at Baden in Switzerland (as distinct from those at Baden in Germany) are wells and springs described by Turner as "so goodlye and pleasant that I never sawe in anye place more pleasaunte and more inhaunted [enchanted] then they be" (ibid. fol. 4^{V}). Most of the values of these baths Turner confesses to having taken from Henrichus Guldenfinger and Conrad Gesner. He quotes some twenty "vertues" from the former, including as the eighth and ninth the seemingly contradictory statements that on the one hand the baths "helpe also them that have the falling siknes ... or the handgout or the foregout of the sciatica if they be commed of a colde cause" and on the other hand that "they are evell for all kind of jaundise and them that have anye kind of goute that commeth of an hote cause" (ibid. fol. 5). If Turner considers this a discrepancy, he does not say so. Indeed he never passes comments on the supposed healing qualities of the baths. Any disputations he has with the authors he quotes are usually concerning the relative amounts of brimstone, saltpetre and alum. Thus, of the Embs waters, he disagrees with Driander that they contain brimstone, alum and salt. Turner says that when he was "serching for the chief miner" which gave strength to the water he found much alum and

some brimstone and iron, but "coulde perceyve by no wit ... anye token of salt there" (ibid. fol. 3). Similarly Turner comments on the baths at Baden in Germany, those reputedly having much saltpetre and alum and some brimstone in them: "But I coulde marke no token at all of brimstone, when I was there, and I coulde perceyve no great lyke tyhod [sic. likelihood] of any alum there" (ibid. fol. 3^{v}).

This suggestion that Turner's real interest lies more in why the baths heal than what they heal is reiterated when he quotes Guldenfinger as saying of the Wilde Bathes that they are warm and not hot owing to the small amount of brimstone and saltpetre. But Turner argues that they must have a considerable amount of brimstone "because they will dispache a man in XIIII dayes of suche diseases as they are ordeined of God to heale" (ibid. fol. 4). This notion, that for every illness of man God has provided a corresponding "natural" cure if one looks for it, seems to have been a quasi-religious overlay to the doctrine of humours. Carried to extremes, it resulted in the doctrine of signatures, to be discussed later.

Turner the divine obviously had no quarrel with the idea of God ensuring appropriate cures for all illnesses, as his phrase "ordeined of God to heale" suggests. Indeed, God as the source of all healing is emphasised in Turner's "generall rules to be observed of all them that will entre

into anye bath" (ibid. fol. 14^{v}) which he gives at the end of the book, cautioning that a clear conscience is a pre-requisite to calling the physician. "If God hath smitten you any disease, before ye go to any bath, for the healing of it, call to youre remembraunce how oft and wher in ye have displeased God. And if any notable synne come to youre remembraunce, occupye the same no more, but be earnestlye sorye for it ..." (ibid. fol. 14^{v}). Turner, the man of medicine, then follows the Galenic formula for diagnosis by sending his patient to "some learned Physician and learne of him by the helpe of youre telling, what complexion ye be of, and what humor or other thinge is the cause of your disease" (ibid. fol. 15). The physician will then recommend the appropriate bath and diet. Concerning the latter, a long list is given of meats to avoid whilst staying at the baths, and it is interesting that the humours doctrine carries over into this area also: "Let therefore your both meat and drinke be in such temper that they be not cold but warme, least when as ye are hote wythin by your bathinge and sweatinge, the colde stricke sodenly into som principall membre and hurte it" (ibid. fol. 16).

There is little that is new or original here though as Raven says "no one previous to Turner had ever written of our English spa." Allowing for "the state of

chemical knowledge at the time", Raven finds the treatise "sane and enlightened" (English Naturalists, p. 114). One must return to the earlier part of the work to find Turner at his practical best. His travels on the continent and in Italy and Germany in particular have left him very dissatisfied with the care of watering-places in England. Baths abroad are "costly and well favoredly ... trimmed" (Baths, fol. 1^{v}) and he urges that some liberal Englishman perform the same service for his own countrymen. Turner further offers advice for their good maintenance and effectiveness as follows: "my counsell is, that every bath have an hole in the bottome, by the whych the stophole taken out the bath should be clenged and scoured every XXIIII houres at the lest ones" (ibid. fol. 2). If such cleansing were done about eight in the evening, the water would be "fresh and holsome" when people come to bathe in the morning, so that they would not only be healed of their old diseases more quickly, but would be "in lesse jeperdy in takinge of newe, whych may easely come unto a man, if he go into a bathe wherein a sicke man, namelye if he be sicke in a smitting or infective disease, hath continewed" (ibid. fol. 2). Turner would have the mainspring of water diverted "by prety canales or condites" into several bathing areas, including private ones for women and separate ones for such folk "as are like in smitting

infectuous or horrible diseases" (ibid. fol. 2^{V}). He even recommends that some of the hottest water be drawn out into a special pool dug on a simple lock system so that "horses that have diseases in the legges and joyntes" (ibid. fol. 2^{V}) may stand in deep or shallow water. The value of steam is not ignored in these plans, and there is a foretaste of the modern sauna suggested in the idea of "a litle house after the maner of a scafholde very nere unto the water after such maner that the hote vapores myght strike hote upon certayn places of mannis body" (ibid., p. 2^{V}). For dropsy and gout this may be a more effective cure than the water itself.

All these practical considerations, with the emphasis on cleanliness (water drawn off for people to bathe privately must not go back into the common pool) are to Turner's credit at a time when infectious diseases were recognised but by no means understood. It is interesting that in 1564, the time when Turner was completing the last part of his herbal, the physician and astronomer, Fracastoro, published a treatise Contagion, Contagious Diseases and their Treatment. Fracastoro imagined that contagion existed as imperceptible particles or "seeds"; and in an earlier treatise of 1546 On Sympathy and Antipathy, he had tried to explain that some people were more susceptible to certain diseases than others because a

stronger force of attraction existed between some "seeds" and individuals than between others. Contagion was given as only one example of attraction in nature. Another was the magnet turning to the north. By observing such "attractions" between natural objects, it was hoped to come to an understanding of how they worked and thus to control them to man's advantage (Hall and Hall, History of Science, p. 133).

Turner's attitude to the doctrine of signatures.

Closely allied to the whole notion of sympathy and antipathy was the doctrine of signatures. This was the belief that to the keenly observant, each natural object had some external characteristic suggesting how it might be used in man's service. Herbs were particularly prone to this kind of scrutiny for medical purposes, so that Paracelsus declared of the thistle: "do not its leaves prick like needles? Thanks to this sign, the art of magic discovered that there is no better herb against internal pricking."[13]

It is somewhat difficult to know whether Turner eschews the signature theory on scientific or on religious grounds. Maybe he does so on both. Certainly good

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[13]Quoted in Marie Boas, The Rise of Modern Science II: The Scientific Renaissance (N.Y.: Harper & Brothers, 1962), p. 182.

protestants repudiated any suggestion of plants resembling holy images. William Bullein in his Booke of Simples (1562) comments on the Pansy (or Two-Faces-in-a-Hood as it was popularly known then): "I read in an old Monkish written Herball ... that this herb did signify the holy Trinitie"[14] But Bullein indignantly denies that the majesty of God may "with reverence, be compared or lykened, by any alligory, to any base, vayne, venerous flower" (ibid.). Certainly Turner seems, by omitting, to ignore any contemporary references to a herb's efficacy which are based on its appearance, where that appearance might have religious significance. For example, Herba Cruciata or Crosswort, described in Banckes's Herbal of 1525 as having "lytell leves and a small stalke with whyte flowres, and it is lyke to a crosse" and recommended as "good to hele woundes"[15] is not mentioned by Turner at all.

However, where the suggestive characteristic is of medicinal rather than religious significance, Turner occasionally mentions it. For example, in the third part of his herbal, writing of Pulmonaria, he says it "hath

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[14] Quoted by Geoffrey Grigson, The Englishman's Flora (St. Albans: Paladin, 1975), p. 81 (hereafter cited as Grigson).

[15] Banckes's Herbal, Sig. D1^{V}.

certayne spottes upon it like as some lunges hath" (p. 56) and thereby christens it Lungwurt or Lungmosse in English. He goes on to recommend it for a variety of ailments, half of which are connected with the lungs. For example, "It joyneth together and healeth grene woundes and speciallye them of the lunges.... This herbe is good for the coughe, short windines, and other diseases of the lunges" (ibid., p. 56). He proceeds to give a recipe for a medicinal drink containing "Lungwurt," "Anis sede," "Fenel sede," "Licores," "Enula campana," "sugar," and "one dram of the lunges of a foxe" (ibid., p. 56). The quantities are so precise as to suggest that Turner was familiar with this medication at first hand, especially when he says "I thinke it were good to geve it also unto a horse that hath bloodye gere comminge out of his lunges by the nosethrilles or mouth" (ibid., p. 56).

This example of Turner confirming the doctrine of signatures is such a rare case that one might conclude he viewed it as coincidence rather than divine directive. Or Turner may have included it because it was true, in this particular instance, that his own experience proved that the illnesses helped by the herb did match the ones suggested by its appearance. Of course, we do not know but that the original Latin name Pulmonaria had first been given because of its efficacy in curing chest ailments

and that the fanciful spotted leaf/spotted lung association came later.

Certainly Turner usually seems at pains to disprove the doctrine where his own experience patently tells him it is not true. He prefers fact to folklore as his treatment of fern illustrates. Because neither flowers nor seed could be observed on it at even a careful glance, fern was commonly supposed to produce seed which was usually invisible. It was believed that those who could gather some of this seed on midsummer eve would, by the doctrine of signatures, have the means of making themselves invisible. Even when this notion was disproved botanically, it persisted in literature through to the present century. Sidney Beisly, in his book Shakspere's Garden, draws attention to the scene between Gadshill and Chamberlain in Henry IV. Part I:

> Gadshill: She will, she will; justice has liquored her. We steal as in a castle, cock sure. We have the receipt of fern-seed, we walk invisible.
>
> Chamberlain: Nay, I think rather you are more beholding to the night than to fern-seed for your walking invisible.
>
> (II.2.1) [16]

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[16] Sidney Beisly, Shakspere's Garden; or the Plants and Flowers Named in his Works Described and Defined (London 1864; rpt. N.Y.: A.M.S. Press, 1970), pp. 90-91.

Michael Drayton presents the idea (without the disbelieving overtones of Shakespeare) in his Nimphidia, the Court of Fayrie (1627) as part of a spell or charm which includes, in addition to fern seed, other old magical herbs and the power of the number nine:

> And first her Ferne seede doth bestowe,
> The kernell of the Missletowe
> And here and there, as Puck should goe,
> With terrour to affright him:
> She Night-shade strawes to work him ill,
> Therewith her Vervayne and her Dill,
> That hindreth Witches of their will,
> Of purpose to despight him.
>
> L.
>
> Then sprinkles she the juice of Rue,
> That groweth underneath the Yeu:
> With nine drops of the midnight dewe,
> From Lunarie distilling.[17]

Sir Walter Scott in his novel Kenilworth takes advantage of the supposed power of fern-seed to help build a character-sketch of Demetrius Doboobie, reputed to be a conjuror. Erasmus Holiday describes Dr. Doboobie to Tressilian: "He cured wounds by salving the weapon instead of the sore - told fortunes by palmistry - discovered stolen goods by the sieve and shears - gathered the right maddow and the male fern seed, through use of which men walk invisible - pretended some advances towards the panacea, or

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[17]Michael Drayton, Nimphidia The Court of Fayrie (Stratford-upon-Avon: Shakespeare head press, and Oxford: B. Blackwell, 1924), p. 25.

universal elixir, and affected to convert good lead into sorry silver."[18]

As recently as this century Walter de la Mare wrote a poem called "Tillie" about an old woman who disappears when sitting by a patch of fern:

> Old Tillie Turveycombe
> Sat to sew,
> Just where a patch of fern did grow;
> There, as she yawned,
> And yawn wide did she,
> Floated some seed
> Down her gull-e-t;
> And look you once,
> And look you twice,
> Poor old Tillie
> Was gone in a trice.
> But oh, when the wind
> Do a-moaning come,
> 'Tis poor old Tillie
> Sick for home;
> And oh, when a voice
> In the mist do sigh,
> Old Tillie Turveycombe's
> Floating by.[19]

The idea of fern having neither flower nor seed came originally from Pliny, according to Beisly (p. 91). Much of Pliny's natural history became part of the fabric of English literature at this time. The borrowing was not always direct; Lyly, for example, drew several of Pliny's ideas from Erasmus, for his Euphues; including the bird

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[18]Sir Walter Scott, Kenilworth (London: Dent, 1948), p. 106.

[19]Walter de la Mare, Collected Rhymes and Verses (Glasgow: University Press, 1967), p. 183.

perching unharmed by the mouth of the crocodile; the method of curing the scorpion's sting by making an oil or ash of the creature and drinking it; and the idea of chewing cress to maintain modesty.[20]

Turner respected Pliny as one of the classical authorities, but he does not hesitate to disprove him if the facts indicate he is wrong. In the case of fern seed, Turner translates and offers as true, Boch's experience with brakes (a kind of fern), thus disproving not only Pliny but Dioscorides, who had said that fern had neither seed nor fruit (Herbal Part 2. Fol. 3):

> Although that all they that have writen of herbes have affyrmed and holden that the Brake hath nether sede, nor frute: yet have I dyvers tymes proved the contrarye. I have, foure yeres together one after an other upon the vigill of Saynt John the Baptiste (whiche we call in Englishe mydsomer even) soughte for this sede of Brakes upon the nyghte and in dede I fownde it earlye in the mornynge before daye brake, the sede was small blacke and lyke unto poppye (Herbal Part 2. Fol. 3).

Rules such as the one repeated by Turner here, that certain seeds, flowers or roots of plants could or should only be gathered at specific times, were very plentiful in mediaeval times. As far as the dates of collection were concerned, obviously this might make good sense, as wild plants would

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[20]John Lyly, Euphues: The Anatomy of Wit, Euphues and His England, eds. M.W. Croll and H. Clemons (New York: Russell and Russell, 1964), pp. 22-23; p. 53 and p. 62.

reach maturity at roughly the same time each year. Therefore, when reading in Banckes's Herbal that Aristologia rotunda "must be gadered in heruest" (sig. $A3^{V}$), Columbina "in August" (sig. C1) and Dragancia "in June and July" (sig. C2), it seems reasonable that these are the times when those parts of the plant used medicinally are most potent. Turner too, refers several times to specific months for specific herb collections. He does not, however, become involved in any of the astrological reflections and directions such as one finds in Banckes's Herbal for Asterion:

> The leves of this herb be round and blewe, and they have the marke of the moone in the myddes ... And this herbe groweth in the newe moone without leves, and every day spryngeth a newe lefe to the ende of XV dayes, and after XV dayes it loseth every day a lefe as the moone waneth, and it springeth and waneth as dothe the moon.... They that ete of the berys or of the herbe in wanynge of the mone, whan he is in signo virginis, if he have the fallynge evyll, he shall be hole therof
>
> (sig. A4).

This is an example of pure astrological doctrine of signatures and nothing like it is to be found in Turner's writings. Indeed, a good example of how he spurned such details can be found in his treatment of St. John's Wort (Hypericum perforatum). This herb was famous as special to St. John the Baptist and was supposed to be picked before sunrise on June 23rd and smoked that evening in the bonfires heralding the 24th, St. John's day. The yellow sun-coloured

flowers represented the "burning and shining light" which Christ called John; and the red juice, according to Geoffrey Grigson in The Englishman's Flora, "could be likened to the blood of St. John at his beheading" (pp. 85-86). When it was discovered that the leaves held up to the light revealed glandular dots like perforations, these dots became a signature of wounds supporting the blood connotation of red juice. So St. John's Wort was recommended as a wound herb or vulnerary in addition to having the magical strength it derived from its association with the saint. Banckes's Herbal says of this plant "If it be putte in a mannes house, there shall come no wycked spyryte therein" (sig. D2), and in as late as John Aubrey's writings, it was praised as a demon scatterer (Grigson, p. 87).

In contrast, Turner's treatment of the herb is prosaic in the extreme. After carefully separating out, on the basis of detailed differences in stalk and leaves, St. John's Grass from great St. John's Grass, he comments on the "vertues": "The sede of thys herbe is good for the scyatica. If it be dronken with water, and honye, about the quantyte of xx. unces: it purgeth largely choleryke humores. But it must be taken contynually, tyll the paciente be hole. This herbe is also good against burnynge" (Herbal Part 1, p. 51). Although he refers specifically

to the holes in the leaves, no religious or superstitious association is suggested. In fact he follows very closely the comments of Dioscorides on this plant.

Similarly, when he discusses Centaury, there is nothing about it growing in the steps of Christ; nor does he mention the incitement to venery popularly suggested by the appearance of Arum masculatum which resulted in its vernacular name, Cuckoopint, with the overtones of cuckolding. However, being for the most part proof against the doctrine of signatures does not free Turner from all less obvious superstitions. In the first part of his herbal (1551) he says of Amaranthus: "The same hong up in houses, is thought to be holsome, and a defence agaynst inchaunting, both unto man and beast" (p. 24). Seaholly and Southernwood he "reports" on good authority as being aphrodisiacs, though he makes it clear that the authority is not his own.

He obviously does not disbelieve that a plant may be medicinally efficacious or dangerous to man without being swallowed. That certain plants could heal, simply by being held in the hand of the patient, was a popular delusion for at least a century after Turner was writing about Burnet:

> Divers of the Practitioners of Germanye do holde that this herbe is good to staunche blood both in the bloody flixe, and also in the issue of bloode that weomen have oute of measure, some holde that the herbe holden alone in ones hand, is good for the same (Herbal Part 3, p. 10).

Dorothy Stimson notes a satire by John Hill in 1751 in which he mocks one of the Royal Society's transactions concerning Asphodell being "so miraculous a Vulnerary, that but to touch it, is to be healed."[21] Also R.T. Gunther relates the story of Elias Ashmole, the antiquary, writing in his diary of how he was cured of the stomach-ache: "I was greatly oppressed in my stomach: and next day Mr. Saunders the astrologian, sent me a piece of bryony root to hold in my hand, and within a quarter of an hour my stomach was freed of that great oppression ..."[22] Similarly, Turner avers that Alysson is as effective held, or smelled with honey, as it is drunk in a broth (Herbal Part I, p. 23). Since he repeats this in the revised version (1568) a decade and a half of practical medicine has evidently given him no reason to change his opinion.

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[21]Dorothy Stimson, Scientists and amateurs, a history of the Royal Society (New York: H. Schuman, 1948), p. 142.

[22]R.T. Gunther, Early British Botanists and their Gardens (1922; rpt. New York: Kraus Reprint Co.; 1971), p. 82.

That some plants may be dangerous without even touching the body he is willing to accept if it is on the authority of an ancient writer of the greatness of Dioscorides. From the latter, though Turner does not say so, he repeats the tale that in the case of Sowerbrede "It is perillous for wymen wyth chylde to go ouer this roote" (Herbal Part I, p. 153). From the less-reliable Pliny, albeit with the caution "if anye credence maye be gyuen unto Plini", he offers the theory that Wolfesbayne swallowed will kill a man unless it finds "poyson" in his "bowelles", upon doing which, it will instead "Stryve as with hys mache" (ibid., p. 9)! Turner concludes (commenting or quoting?) "And marveyl it is, that two dedly poysones do both dye in a man that the man may lyve" (ibid., p. 9).

This, of course, is an example of homeopathic medicine or "like combating like", and it has had its adherents all through the centuries, some of whom have been genuine scientists and doctors. It came very much to the fore again in the early nineteenth century when a Dr. Samuel Hahnemann found that the cinchona bark used in treating malaria produced similar symptoms when eaten by someone well, as those experienced by a malaria victim. X-rays and radium, which may in large doses cause cancer, are used in small quantities to cure it. Digitalis is used to treat heart disease with symptoms almost identical with those

which would result from an overdose of this foxglove derivative. Since many modern scientists and doctors sit on the fence regarding homeopathy, it would be difficult to blame Turner for doing the same. By Part 2 of the herbal, he is obviously sceptical of the poison-heals-poison theory, for in commenting that the poisonous Oleander is recommended only as a medicine for poisons, Turner says he would counsel no one bitten by a serpent to take oleander "if there be any triacle or other good herbe" around instead (fol. 65^{v}).

Turner's attitude to transmutation of species

A rather differently-based belief and one which would have very few adherents today, except perhaps amongst primitive peoples, would be the belief in transmutation or the change from one form or substance into another. One tends to associate this with mediaeval alchemists and their belief in the use of the "philosophers' stone" to change baser metals into gold. Innumerable vague experiments were supposed to prove this, but not surprisingly, no clear written accounts have survived. Less well known but equally entrenched amongst biologists was the idea that one species of plant or animal could change into another. Thomas P. Harrison in his paper "William Turner, Naturalist and Priest" is concerned with Turner's writings on birds and feels that in this area, Turner the scientist is

sceptical of transmutation. Harrison points out that Turner refutes even as great an authority as Aristotle, when that writer's ideas do not conform with Turner's own observations. Aristotle had said that the robin and the redstart change into one another, but Turner accused the ancient writer of relying more on the tales of fowlers than on his own experience.[23] Turner agreed that the young of robins and redstarts are identical in appearance, but it is their differing habits which cause the confusion. Robins retire to lonely places after the spring nesting whereas redstarts do not. Thus, young robins re-appearing in the fall are mistaken for the redstarts, which have in fact disappeared for the winter. Although Turner's work on birds is written in Latin, it is a good example of his denying a transmutation. However, it is probably not wise to feel that Turner rejects the whole idea of transmutation. Maybe he was sceptical about the phenomenon in birds, but he certainly believed it could happen in plants. In the first part of his herbal, writing of the Blewbottle (or what would today be called the Cornflower), he says, "It groweth muche amonge Rye: wherefore I thynke, that good ry, in an evell and unseasonable yere doth go out of kynde in

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[23]Thomas P. Harrison, "William Turner, Naturalist and Priest", Univ. Texas Studies in English, 33 (1954), p. 8.

to thys wede" (Herbal Part I, p. 153). This seems to be Turner's own opinion. It is not qualified by a cautious "some do say" with which he so often hedges statements about plants' properties. Earlier, in The Names of Herbes, he said of Darnel, "Darnel groweth amonge the corne and the corne goeth out of kynde into Darnel (sig. E2). In Part 2 of his herbal he seems to be convinced there is a whole transmutation cycle at work in the case of rye:

> For thys I do know, that in a countre where as I have ben, wythin the Dukedom of the Duke of Cleve, called Sourlant, that wheat if it be sowen in that sourlande, as it is truely called, the fyrste yeare it will bring furth wheat, and in the second yeare, if the wheat that grew there, be sowen in the same place agayne, that it turneth into rye, and that the same rye sowen in the same ground, within two yeares goeth out of kinde into darnell & suche other naughty wedes, as rye sowen in som place of Saxony, as I heard say, when I was in Germany, with in a few yeare sowen in some feldes, is turned into good wheat.
> (fol. 129)

It must be remembered, however, that Turner's acquaintance with the classical writers would have attuned his mind to the possibilities of transmutation, for Theophrastus mentioned a change of Spelt into Oats, and Virgil suggested a similar phenomenon in his verse:

> In furrows where great Barley we did sow,
> Nothing but Darnel and poor Oats do grow.
> (quoted by Gunther, p. 63)

Seventy years after Turner was writing about Rye turning into Cornflowers, John Goodyer the highly-esteemed botanist,

was theorising that "the seed of Sweet Marjoriam might degenerate and send forth Acinos odoratissimum" (ibid., p. 36). Twelve years afterwards, in 1632, he found what seemed to him an example of "the partial change of an ear of wheat into oats," thus upholding Theophrastus. He was supported in his opinion by an equally famous botanist, Thomas Johnson, who himself saw the ear in question and wrote that it was highly unusual

> that two severall grains, perfect in each respect, did grow at any time in one eare: the which I saw this yeare 1632, in an eare of white Wheat, which was found by my very good Friend Master JOHN GOODYER, a man second to none in his industrie and searching of plants, nor in his judgement or knowledge of them. This eare of wheat was as large and faire as most are, and about the middle thereof grew three or foure perfect Oats in all respects (ibid., p. 63).

Obviously, two such reliable and practical botanists would not lie. They saw something, maybe an aberration in the wheat ear, which was sufficiently like oats to convince them. It has been assumed that Goodyer was so impressed with his find that it was the genesis of the Goodyer crest - a partridge carrying in its beak a "good ear" of wheat (ibid., p. 63).

Francis Bacon in 1627 was prepared to accept the theory of transmutation and suggested an experiment whereby seeds of a plant one wished to change should be buried in the earth amongst seeds of the other plant "And then you

shall see whether the iuyce of those other seeds doe not so qualify the Earth, as it will alter the seed, whereupon you worke. As for Example ... put Basill-seed amongst Thyme-seed, and see the change of taste, or otherwise" (ibid., p. 62). If Turner believed in transmutations of plants when his own experience could give no alternate explanation for the non-growth of certain deliberately-planted seeds, then at least he was in good company!

Insights gained from the religious tracts.

A slight but significant sidelight on Turner's attitude to both traditional and changing scientific theories of the sixteenth century, may be found on reading his religious tracts, particularly the one entitled A new booke of spirituall Physik for dyverse diseases of the nobilite and gentlemen of Englande (1555). This work is an attack on the irresponsible behaviour of many English nobles, particularly those who have newly acquired titles and land, often by doubtful means. As Raven says in English Naturalists, Turner had learned from Latimer "a prophetic hatred of injustice and greed and the oppression of the poor" (p. 61). Turner uses both animal and medical metaphors to describe various types of dissipated gentry and their spiritual ills.

The nobility is not exempt from work and responsibility, and those members of it are mistaken who

think "that the proper office worke and callynge of a gentleman, is onlye to hauk and to hunt, to dyce and to carde, to sweare and to bragge, to pype synge and daunce ..." (Spiritual Physik, fol. 4^{V}). Turner believes that God has made men in each estate of English life for a purpose. He compares the body politic of the commonwealth (i.e. England) to a man's physical body: "The same thynge maye ye learne of the partes of a mans body, wher in no parte is so lytle or smale, but it serveth for one purpose or another. As ye maye well learne of Galene the Phisiciane (ibid.) ... Nature hath ordeyned that the heade shulde governe and rule, al other partes of the bodye" (fol. 24^{V}). Those who are set above the common people are responsible for the dissemination of the true (i.e. non-popish) faith through the scriptures. To be capable of this, gentlemen must eschew frivolity and the idle habit of accepting spiritual ideas at second hand, which, Turner warns, leads to "an hole palsey", a spiritual numbness. The only remedy is learning, "for gentlemen to go earnestly unto their bookes" (ibid. fol. 24), and that they "should studye and reade the scripture in their owne persones" (fol. 29) for "the true understandynge of Goddes worde ... can not be had without prayer, great payne, labour and exercise" (fol. 32).

Turner does not limit this first-hand learning to the nobility. "Learnyng is unto a yoman in the stede of

sylver, to a gentleman in the stede of golde, and to erles and princes in the stede of precius stones" (ibid. fol. 32^{V}), but he stresses independence from all spiritual advisors, obviously downgrading Roman Catholic priests ("spiritual and unmaryed men") whom he likens to cooks prone to dispensing spiritual poison. It is significant that this treatise was written in 1555 when the abuse of Church patronage was rife.

Later in the tract, he urges Bishop Gardiner (whom he believes to have turned Catholic) to set forth his doctrine of King Henry's marriage "in Englyshe at large, because the common people may learne some holsome doctrine of it" (ibid. fol. 40^{V}), and again he wishes to protect unlearned men from the mesmerising effect of the Latin-chanting priests who "rede over the sicke persons heades, Christes above named medicines in Latin; as though the bare redynge of the phisicians byll in a straunge tonge, shulde helpe the syck men when as they understande never one worde thereof" (ibid. fol. 63^{V}).

However, Turner himself is not above using a little of the mesmerising effect of authority, if not of Latin, to suit his own Reforming purposes. In his tract The Huntyng of the Romysh Wuolfe of 1554 written the year before the publication of Spirituall Physik, he compared Bishop Gardiner to a fox which has turned into a wolf; that

is, the Anglican has become a Catholic. The same Turner who as a scientist argued against the transmutation of robins into redstarts several years earlier, now becomes Turner the divine, using precisely this transmutation as one example of a natural law: "an olde foxe mai go forth of kinde, into a Wolfe ... Pismiers go out of kind, in flies, Colewormes grow into Butterflies, Serpents into Dragons. Aristotle writteth, in his boke, de historia anima, that a Red brest, is turned into a Redtale."[24]

Readers are obviously meant to assume that Turner agrees with Aristotle, since after strengthening his argument still further with the example of Nebuchadnezzar's being changed into a beast (in the book of Daniel) Turner triumphantly declares that it is against neither nature nor the word of God "that an old foxe, should be turned into a Wolfe." Again, in Spiritual Physik he uses the metaphor of transmutation, though not that of any specific creatures, when describing members of the nobility who are suffering from spiritual dropsy, or an overwhelming thirst for other people's property: "Indede I fynde this dropsy for the moste part always in the crowish stert uppes, and not so muche in the ryght and olde nobilitie. How be it, even some of the stocke of the olde nobilitie, have growen

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[24]William Turner, The Huntyng of the Romysh Wuolfe (Zurich, 1554), S.T.C. 24356, sig. B1.

and gone out of kynde, and are also sycke in thys common sycknes" (ibid. fol. 50^{V}), and he describes how many of the old houses are absorbing so much common land that they are encroaching on "the very hyghe wayes, and the foule puddels in them" (ibid. fol. 51).

Here in these religious treatises the voice is that of Turner the preacher, writing within the old exemplum tradition of relating real or imagined properties of plants, animals and stones and then using these properties to teach moral lessons. Over the years the more marvellous and less accurate tales were used because they would catch and hold the attention of an audience and more likely suit the preacher's purpose. Although the use of exempla declined after the Reformation, they were until that time very common in sermons and religious treatises. J.A. Mosher points out that even such a reformer as Turner's friend and mentor, Hugh Latimer (to whom Turner dedicated his Poyson of Pelagius) was "not altogether beyond the pervasive influence of exempla."[25]

Yet, although one would agree with Thomas P. Harrison that Turner is more mediaeval in his religious writings than in his scientific works and uses the natural world as a source of parables warning or urging man

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[25]Joseph Albert Mosher, The Exemplum in the Early Religious and Didactic Literature of England (New York: Columbia University Press, 1911), p. 114.

towards better behaviour, it still seems unlikely that Turner, even as a scientist, disbelieved in the whole theory of transmutation. He was sufficiently confident in his first-hand knowledge to refute those instances which he knew to be untrue, but the idea of transmutation seems to have been acceptable to him, at least until more cases could be disproved.

One must recognize how attractive the whole idea of transmutation must have seemed before the advent of the microscope. Butterflies are very different in all respects from caterpillars, yet the latter do become the former. It is not really surprising that people imagined species could transmute, one into another, particularly where the outward forms were not very different.

So if Turner seems scrupulous in his scientific writing in contradicting the robin/redstart change, yet uses the same example in religious persuasion, it does not necessarily follow that he disbelieves the other examples he uses - the pismiers, Colewormes, etc. or even the fox into the wolf. But it is evident that in his religious fervour Turner is prepared to turn botanical or naturalist "hearsay" to good account. For example, much traditional medical practice comes forth in his advice on healing the Romish pox, caught by those who follow the false religion of Rome with all its superstition and

idolatry. Turner equates the spiritual symptoms with the physical symptoms of syphilis. Such gentlemen, according to the tract, have their "spiritual noses ... quyte eaten awaye" and "can smel nothynge at all" (Spiritual Physik, fol. 73). That is, their judgement is impaired by their obsession with such things as images and the mass. The cure follows the traditional humours doctrine: "Every fyfte daye or syxte: they muste be purged, and ofte tymes muste they swet, that all the evel humores may go IIII. wayes out, by the pores, by the foundament, by the water vessels, and by the mouthe" (ibid. fol. 78^{v}). Furthermore, "Because the mater of this disease is very grosse, we must prepare it wyth bitter herbes as is repentaunce, and suche other, as with their heat or bitterness wil cut them in sonder" (ibid. fol. 79).

The bitter herbs of repentance, traditional in religious writings, are specific biblical readings concerning the repentance of sins, which Turner gives in full, both in Latin and English. He then reminds his readers of how Moses healed the Israelites of Baal-worship by burning the golden calf into powder and giving them "the powder of the very same to drynke wyth water." So must the nobility burn their "crosses ... copes ... mesbokes ... bedes ..." and "caste the ashes of them into the water and drynke as muche of them, as cometh unto your parte ..."

(ibid. fol. 81^{V}). Lest "Any scripture scorner, which can abyde nothing but mans learnyng shulde dispise thys maner of healyng of sik folkes, wyth the eatyng of suche thynges destroyed as have hurte them before" (ibid. fol. 81^{V}) he continues by relating that a viper with head and tail removed, eaten along with other medication, cures poisonous bites including those of the viper itself and also "preserveth men from poysons that shalbe taken afterwarde" (Spiritual Physik, fol. 82). Whether this can be interpreted as the creation of antibodies in the bloodstream against future poisons is not sufficiently clear. The scorpion too, "rosted and eaten", heals "his owne poysoned byttyng" according to Dioscorides and Galenus (ibid. fol. 82). This is a very old idea which, as was mentioned earlier in this chapter, was borrowed from Pliny by Lyly in Euphues. It is a further example of homeopathic medicine which continues to be found in folklore and literature. In Mark Twain's Huckleberry Finn Jim, the negro, is bitten by a snake and Huck relates the cure: "Jim told me to chop off the snake's head and throw it away, and then skin the body and roast a piece of it. I done it, and he eat it and said it would help cure him. He made me take off the rattles and tie them around his wrist, too. He said that that would help."[26] For scripture and philosophy to agree that poison

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[26]Mark Twain, Huckleberry Finn ([Don Mills]: Nelson, 1968), p. 45.

heals poison is sufficient for Turner's argument. There is no mention of personal observation and experience here.

However, there is a very detailed simile of a covetous gentleman (that is, one having spiritual dropsy) being "lyke a gredy gliede" which is obviously full of accurate first-hand observation. Turner describes the "gliede" or "kyte" as looking from a distance like a hawk "whyche is a noble byrde" (ibid. fol. 54) which is true. But in typical exemplum tradition, for the purpose of his moral lesson Turner then moves shamelessly from the objective to the anthropomorphic, saying of the kite "ye shall knowe hym by hys whinning and lamentable pewynge, as thoughe he coulde never get enoughe." He comments on the unselective nature of the bird when feeding - "al kynde of carion ... wormes ... goslynges, ducklinges, chickins" are grist to his mill (ibid. fol. 54-54^{v}). Turner then continues to build his case against the bird by confessing that "nether in Italy, nether in any part of Germany" where he has travelled has he seen kites as bold as those in England which will "dare take butter and bread, out of boys handes in the stretes, of townes, cities and villages" (ibid. fol. 55).

Obviously, members of the English nobility are bigger thieves than their European counterparts, and Turner moves further from objectivity as he concludes his allegory.

What does the kite gain from all his thieving? "For he abydeth styl a foule kyte, and hys yonge ones, as I have sene it my selfe, ar always slaveryng it out, that the father hath stollen and robbed for them" (ibid. fol. 54^{V}). One imagines the nestlings might be prone to regurgitate more because of the indiscriminate nature of the diet than because their dinners were stolen, since it also includes "trypes and puddynges" taken from under housewives' noses!

One can hardly blame Turner for taking advantage of such a splendid and picturesque parallel between this gluttonous bird of prey and the nobility he despised, for it brought him so admirably to his admonition: "Marke here howe that nature teacheth us, howe that it whych is gotten wyth ravin and robbery, is as soone spent and wasted of the chyldren, as the covertus fathers have gotten it" (ibid. fol. 54^{V}). Such uses of exempla add much to the satire, the vigour and the direct railing style which marks all Turner's religious writing, and he was doubtless aware of their persuasive power. The passion of the religious and social reformer permeates the treatises. After reading them, with all their vehemence and often, vindictiveness, one is surprised afresh at his sober and painstaking approach to science which is the concern of the following chapter.

CHAPTER III

THE ELEMENTS OF TURNER'S SCIENTIFIC STYLE

Part 1. The historical background of Turner's scientific prose

This chapter is concerned with Turner's scientific style; with his use of the English language, specifically in the three part herbal, for describing and identifying plants. Consideration is given to his skill in relating sensory impressions, his discrimination in the choice of detail, and his comparative sobriety in the use of imagery. It will be seen that the care with which Turner chooses certain words for scientific purposes justifies his being quoted so often in the Oxford English Dictionary and that his use of language anticipates the more organised botanical terminology of the following century. An examination of English plant-names coined by Turner shows they are based solidly on fact rather than fancy although sometimes a gain in accuracy means a loss in charm. Underlying the prose is Turner's struggle to make the English language serve his purpose: he was a pioneer in his attempt to record, in his

native tongue, observations about plants which were thorough and accurate. The English vocabulary of the mid-sixteenth century was hardly ready to meet the demands Turner was making.

The reason for this can be traced back to the Norman invasion of 1066 and the subsequent introduction of the French language into English life. Though the native language did not die out, French and Latin were used extensively in written works, French being the language of romance and law, Latin the language of history and theology. By the mid-fourteenth century, national feeling was starting to reject French and to promote English. Wiclif's first translation of the Bible, completed in 1384, was important because he chose English as the language with most appeal for his fellowmen. Although he found the English vocabulary inadequate (as Turner was still to do one hundred and fifty years later), Wiclif's prose was vigorous with a strong colloquial base close to the speech of his readers.

Wiclif shared with John of Trevisa, who was writing about the same time, a desire that his works should be easily understood. Trevisa translated Higden's Polychronicon between 1384 and 1390, and prefacing his translation is a dialogue between a lord and a clerk in which Trevisa discusses his choice of English prose in contrast with the French fashion of using verse. The lord says that prose is

"more easy and more plain to know and understand."[1] English scientific prose might be said to start with Trevisa's translation of Bartholomaeus' De Proprietatibus Rerum, published in about 1495, and with Chaucer's translation of A Treatise on the Astrolabe (1391) from a Latin version of an Arabic work. Addressing his ten year old son in the preface to the Astrolabe, Chaucer claims that he has "hit translated in myn englissh only for thi doctrine ..."[2] It is in this tradition of using English prose for instruction that Turner, some hundred and fifty years later, was to compose his work on plants.

Meanwhile, from the beginning of the fifteenth century, English was becoming increasingly respectable as a written as well as a spoken language. From 1416 there was a succession of London documents in English (Chambers, p. cxii) and English began to replace French among guilds and businesses and in the everyday affairs of the middle classes. But with its wider use came an awareness of its inadequacies so that by 1422, the year in which the earliest of the Paston letters was written, the London brewers spoke

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[1]Quoted in R.W. Chambers, On the Continuity of English Prose from Alfred to More and his School (1932; rpt. London: Oxford University Press, 1966), p. cxi.

[2]Geoffrey Chaucer, A Treatise on the Astrolabe, ed. W.W. Skeat (1872; rpt. Oxford: University Press, 1968), p. 2.

of "augmenting the English tongue" (ibid., p. cxiii). For the next century and a half deliberate attempts were made to enrich the native language, as French and Latin words were anglicised to help convey finer distinctions in meaning.

Often however, this resulted in pretentiousness rather than clarity, as long words became popular more for the learned tone they carried than for their efficacy in making a matter plain. After the advent of printing in 1450 had to some extent stabilised English prose, augmentation of the language continued, Caxton himself drawing heavily on French. The excessive use of French and English synonyms became ornamentation rather than clarification and eventually was known, together with all other conscious pedantry and aping of foreign expressions, as "inkhornism."

Experimentation with words continued so that from 1500 onwards there was a great expansion in the English vocabulary, but even this was often insufficient to meet the demands of scientific discovery and experiment so that writers had to be satisfied with rough substitution or had to coin fresh terms. Sir Arthur Quiller-Couch commented: "it certainly was not foreseen that men of science would soon be making discoveries at a rate which left their skill in words outstripped; that having to invent their terms as they went along ... they would bombast out our dictionaries

with monstrously invented words ..."[3]

Many writers preferred to continue in Latin rather than cope with the vagaries of English. It was felt that some subjects should not be presented in English, even in translation. An example is shown in Thomas More's Dialogue against the Reformers when the question arises as to whether the scriptures should or should not be translated into English.[4] More himself was one of many literary men who was writing in both Latin and English prose at the start of the second quarter of the sixteenth century whilst Turner was at Cambridge. English prose at this period veered between an easy familiarity not too far removed from colloquial speech and a much more structured, careful form in the classical mould. More, unlike most of his contemporaries, managed to combine the best of both styles into a personal harmonious expression, using "the native idiom for literary purposes" (ibid., p. 100).

Even so he was too elaborate for William Tyndale, who termed More's writing "babbling eloquence."[5] Tyndale

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[3]A. Quiller-Couch, On the Art of Writing, 2nd ed. (1916; rpt. Cambridge: University Press, 1933), p. 29.

[4]G.P. Krapp, The Rise of English Literary Prose (1915; rpt. New York: F. Ungar Publishing Co; 1963), p. 89.

[5]Krapp, p. 105 (quoting from Tyndale).

cultivated a plainer written style, wishing to communicate "simply, clearly and sympathetically with his fellow Englishmen."[6] His New Testament of 1525 used, almost exclusively, words of Anglo-Saxon origin which Tyndale felt would reach the common people "that they might se the processe, ordre and meaning of the texte."[7] He achieved a good balance between simplicity and dignity and helped to re-establish the use of "pure" English words rather than latinised ones. Enrichment from French and Latin sources continued nonetheless, so that by mid-century non-scientific ideas could be transferred fairly successfully from Latin to English and the Prayer Book in English consolidated the move towards "national realisation and expression"[8] which had started two hundred years earlier.

Fortunately the wildest careerings of word coinage, of pedantry and inkhornism, were constantly checked by able critics, not the least of whom were Sir John Cheke and his two most famous pupils, Roger Ascham and Thomas Wilson. Raven, in English Naturalists, argues effectively that Turner probably knew both Cheke and Ascham (pp. 54 and 72). Raven

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[6] Krapp, p. 108.

[7] Ibid., p. 235 (Krapp is quoting from Tyndale).

[8] Ibid., p. 262.

also quotes a letter from Turner to Foxe which shows that Turner did not support the changes taking place in the English language. Turner felt that even Tyndale's modernised versions of older English works were not necessarily an improvement, adding: "... I feel no great obligations to those persons who have translated Piers Plowman, Gower and Chaucer and authors of a similar stamp into a mongrel language neither true English nor pure French" (English Naturalists, p. 57). Cheke advocated a largely native English vocabulary and, according to his pupils, encouraged direct, plain writing which could be understood by the simplest reader. Like Turner, he was also anxious that people should think for themselves rather than have their opinions formed in advance by "commonly received notions."[9]

The language controversy continued into the third quarter of the century so that at the same time Thomas Wilson was saying that plainness and intelligibility were the prime requisites of a prose style, Richard Sherry was defending the continued coining of new words in his Treatise of Schemes and Tropes (1550).[10]

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[9]C.S. Lewis, English Literature in the Sixteenth Century Excluding Drama (Oxford: Clarendon Press, 1954), p. 283. (Lewis is quoting from Strype).

[10]Krapp, p. 309.

Ascham's opinions on English prose style are probably better known than Wilson's because they are so well expressed in the preface to Toxophilus, his book on archery. Written in 1545 primarily to promote the sport of the long bow which Ascham admired, the book's own careful, elegant style was itself an example of a good vernacular prose and helped to strengthen the move away from Latin. In his preface, Ascham complains that the use of Latin, French and Italian words by English writers makes "all things dark and hard." He goes on to liken such enrichment of the English language to putting "malmsey and sack, red wine and white, ale and beer" all in one pot. Each is good taken alone, but together they make a drink "neither easy to be known, nor yet wholesome for the body."[11]

This was the climate of language controversy during the middle of the sixteenth century, when Turner was writing. It has been shown in a previous chapter that he transferred into his religious tracts much of the self-assertive, railing style of his preaching, so typical of many supporters of the Reformation. But in writing of plants Turner is not so much exhorting and haranguing as describing and explaining. His role as a scientific author is that of

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[11]J.A. Giles, The Whole Works of Roger Ascham, 4 Vols. (1864; rpt. New York: AMS Press, 1965), III, 7.

a knowledgeable and thorough teacher anxious to educate in plant recognition and use not just the learned, but any Englishman who could read his native language. As he says in the preface to the second part of his herbal: "To them that woulde that I should have writen in Latin; I answer, that as I am naturally bounde, I have first set out my bokes of herbes in Englishe for the profit of my contremen" (sig. $A2^{V}$).

In wishing to educate his fellow Englishmen through their native prose he was following in worthy footsteps, but few of the previous walkers had followed scientific paths, except in translation. By Turner's day, treatises were popular in mathematics, astrology and alchemy. The areas approaching botany, such as gardening and agriculture were also well represented with very practical details on the setting out of plants. For example, John Fitzherbert, one of the first of several agricultural reformers in the sixteenth century, wrote The Book of Husbandry in 1523, but as the following extract on the sowing of peas and beans shows, he was not attempting to write anything which could not be easily discussed verbally in the vernacular (though he does mingle in some religious moralising with the husbandry throughout):

> and when ye se seasonable time, sow both pees and beanes, so that they be sowen in the begynnynge of Marche. Howe shall ye knowe seasonable tyme? go uppon the lande, that is plowed, and if it synge

> or crye, or make any noyse under thy fete, than it is to wete to sowe: and if it make no noyse, and wyll beare thy horses, thanne sowe in the name of god.[12]

Also popular were semi-scientific treatises on medical matters such as Sir Thomas Elyot's Castle of Health, the earliest important health manual written in English. First published in 1534, it went through fourteen editions between 1539 and 1610. Forestalling any complaints about a non-physician, and a knight at that, giving advice on health, Elyot gives his qualifications as having read some of the writings of Galen, Hippocrates, Celsus, Pliny, Dioscorides and others. Like Turner, he anticipates that physicians, jealous of the mystery of their art, will resent a medical work in English, so he cautions: "let them remember that the Greekes wrote in Greeke, the Romaines in Latine, Auicenna and the other in Arabike, which were their owne proper and naturall tongues."[13] Elyot asserts in his "Proheme" to the 1541 edition that he is "studious" for the "weall of his Countrey" (ibid., sig. ¶ 2) in preparing this book for physicians - "for their commodity" (ibid.,

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[12]Anthony Fitzherbert, The Book of Husbandry, ed. Walter W. Skeat (London: English Dialect Society, 1882), p. 19. This work is now attributed to John Fitzherbert (see S.T.C. 10996).

[13]Sir Thomas Elyot, The Castle of Health (London, 1610), S.T.C. 7657, sig. 4.

sig. ¶ 3^{v}). There follows an alphabetical table of contents, samples of which indicate the broad scope of the work:

Braine cold and dry
Braine sicke
Breast sicke
Beefe
Beanes
Breakefast
Bloudsuckers
Bourage
Bread
(ibid. sig. A1)

Sugar
Syrope acetose
Springtime
Summer
Scarifying
Sicknesses appropried to sundry seasons and ages
Significations of sicknes
Substance of urines
Spices
(ibid. sig. A2^{v})

There is an explanation of the Doctrine of Elements according to Galen and of the Humours theory with its resulting four personality types. Details are given as to what constitutes health and sickness in each personality. Specific instructions are given for the maintenance of good health, such as avoiding

> Meates which doe hurt the teeth - Very hot meates, Nuts, Sweete meates and drinkes. Radish rootes, Hard meates, Milke, Bitter meates. Much vomit [presumably the vomit nut referred to by Turner in Part 3 of his herbal, p. 49], Leekes, Fish fat, Limons, Coleworts.
> (ibid. sig. D1)

Elyot's style is relatively clear, simple and direct - almost like notes - and as Raven says, the work contains enough about plants "to show its author's interest in them" (English Naturalists, p. 43). In a section of Book IV dealing with "Crudity" (bad digestion) and lassitude (disposition towards illness) there is some suggestion that the advice about the correct foods to suit different

temperaments is based on personal experience though, as Lehmberg says, not on "clinical experimentation."[14] Elyot quotes his authorities, including the Bible and large amounts of Galen, without argument. Although he is immensely readable, he goes over old ground and in doing so makes few demands on the language.

However, Raven considers that Elyot had a good practical knowledge of plants and was probably acquainted with Turner and exchanged information with him. Similar descriptions are given in Turner's Libellus and Names and Elyot's Dictionary (English Naturalists, p. 73). Such descriptions, however, were nothing like as ambitious as those which Turner was attempting in his herbal. Turner was endeavouring to write descriptions of plants with an attention to realistic detail as yet untried in the English language. When the ancient Greeks similarly had tried to describe plants in Greek, a lack of scientific nomenclature had hindered them also. Theophrastus in particular had tried to give a technical meaning to certain words so that, as Charles Singer explains in A History of Biology, the botanical definitions of "fruit" and "pericarp" have come down to us from the ancient Greek.[15]

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[14]Stanford E. Lehmberg, Sir Thomas Elyot, Tudor Humanist (Austin: University of Texas Press, 1960), p. 147.

[15]Charles Singer, A History of Biology to about the year 1900, 2nd ed. (1931; rpt. London and New York: Abelard-Schuman, 1962), p. 47.

Naturally enough Turner falls back on his sound knowledge of Greek and Latin botanists for descriptive phrases so that occasionally (and Turner usually acknowledges it) some of the plant descriptions are word by word translations of Dioscorides. Turner's own style is obviously influenced by that of the classical writers, but true to the instructive purpose he proclaims, he rarely lets his learning obscure his writing. Where possible, he seems to follow the Ciceronian injunction of keeping his language "level with the actual subject and adequate to it."[16] Difficulties arise when the language itself is inadequate.

It must not be forgotten that in the principle of what he was doing, Turner was not alone. On the continent, botanists of comparable and even superior stature to Turner were not only translating and expounding the classical authors but were composing original scientific works in their native languages. In the Prologue to the first part of his herbal, Turner praises "Fuchsius, whych wrote an Herball in Latin, and afterwardes translated the same into Duche his owne countre language" (sig. $A2^{V}$). Agnes Arber in her book on herbals, writes of Jerome Bock (1498-1554; like Fuchs, one of the German "fathers of botany") describing his botanical finds in "the plain, racy German of the

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[16]Quiller-Couch, Art of Writing, p. 25.

people."[17] A niewe herball, the work which became so popular in England at the end of the sixteenth century, was a translation by Henry Lyte of Rembert Dodoens's Crüydeboeck, first published in 1554. Although Lyte's translation was from the French version, the original was in Flemish for Dodoens, the first well-known Belgian botanist, wrote in Flemish as well as Latin. So Turner was not alone in having to find an adequate vernacular terminology for his purpose, he was only alone in having to find that terminology in English.

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[17] Arber, Herbals, their Origin and Evolution, p. 59.

Part 2. Turner's descriptive prose and terminology

On first consideration it might seem that botany, more than physics or chemistry, would by Turner's time have accrued a fair sprinkling of at least semi-technical terms in the vernacular. Plants had been a close part of man's life for centuries. In addition to using them for healing, for food and as building materials, he had adorned his altars, homes and even his person with those considered to have symbolic or magical powers. But the relationship was a subjective one and therefore the language used was more concerned with the men than with the plants themselves. As for the actual identification of plants, this was passed on by herb-gatherers to their apprentices in the practical setting of wood and meadow where living samples could be located, picked and memorized without the benefit of written, or even much verbal description.

Mediaeval man did not view plants dispassionately, but interested himself in them because of their agricultural or medicinal value. As Chapter II showed, the latter was as much based on superstition as fact. Paralleling this was the allegorical attitude to nature, using plants and animals to illustrate moral and metaphysical lessons. From this viewpoint all nature was regarded as "a storehouse of symbols

or intimations of a different and more perfect world."[18] This led to distortion in the description of the appearance and behaviour of plants and animals in an effort to make them demonstrate moral dogmas in a memorable, and often entertaining, way.

This emphasis on entertainment rather than fact is evident in a work such as The Book of Secrets of Albertus Magnus first published in England in about 1550. It was one of many books of "secrets" dealing with marvellous properties, mostly imagined, of plants, animals and stones. Reputable writers, such as Albertus Magnus, did not actually contribute to these books, but the popular press capitalised on the respect in which such great names were held. Although sympathetic magic is the basis of many of the recipes, there is some emphasis on the importance of proof, and M.R. Best and F.H. Brightman in their edition of The Book of Secrets point to the frequent use in the Latin text of "experimentare" (i.e. experiment) as well as "experire" (i.e. experience).[19] However the preface to the first English edition suggested the book should be treated as light reading and as such there is little to tax the mind. Emphasis seems to be on the

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[18] F.D. and J.F.M. Hoeniger, The Development of Natural History in Tudor England (Charlottesville: University Press of Virginia, 1969), p. 6.

[19] The Book of Secrets of Albertus Magnus, ed. Michael R. Best and Frank H. Brightman (Oxford: Clarendon Press, 1973), p. xvii.

old beliefs concerning the magical properties of herbs. Thus from vervain root one can derive not only medical benefit - "put upon the neck [it] healeth the swine pox, impostumes behind the ears, and botches of the neck, and such as cannot keep their water" - but financial benefit also: "If any man put it in his house or vineyard, or in the ground, he shall have abundantly revenues, or yearly profits" (ibid., p. 22).

Obviously such works as this did little if anything to add any technical terms to the English language. Nor did the early compendia of plants and animals, such as the many translated editions of Hortus sanitatus published in the early sixteenth century, bring anything new except perhaps an extension in the medical uses of plants. Encyclopedias such as De Proprietatibus Rerum, listing all known plants and animals, continued to be printed, but they were only slenderly based on direct observation. In these works, fables from literary sources gratified readers' curiosity and met the demand for marvellous tales.

Poets tended to use such works as their authorities on natural history, together with The grete herball and Banckes's Herbal. The first of these was a translation of the French herbal, Le Grant Herbier, but like Banckes's Herbal, the first book exclusively devoted to herbs printed in England, it was mediaeval in character. Both books are more

concerned with traditional virtues and medicinal prescriptions than with plant description, although the descriptions in Banckes's Herbal are fuller and more literary in the second half. Throughout the sixteenth century and well into the next, the poets' plant-lore derived from the above-mentioned sources was picturesque and symbolic rather than scientific. John Skelton (1460-1529) in the lyrics to the Countess of Surrey and her ladies-in-waiting incorporated into his "Garlande of Laurell" (1523), is more concerned with the traditional "virtues" of flowers than with their appearance.[20] For example, "To Mistress Margery Wentworth" develops its theme around the three plants marjoram, primrose and columbine:

To Mastres Margery Wentworthe
With margerain jentyll [i.e. cultivated, as distinct
The flowre of goodlyhede, from wild O.E.D.
Enbrowdred the mantill "gentle" a. and sb. 4]
Is of your maydenhede.

Plainly, I can not glose, [i.e. flatter O.E.D. "glose"
Ye be, as I devyne, v. 2]
The praty primrose,
The goodly columbyne.
With margerain jantell,
The flowre of goodlyhede,
Enbrawderyd the mantyll
Is of yowre maydenhede.

Benynge, corteise and meke,
With wordes well devysed,
In you, who list to seke,
Be vertus well comprysed.

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[20]John Skelton, Poems, ed. Robert S. Kinsman (Oxford: Clarendon Press, 1969), p. 128.

With margerain jantell,
The flowre of goodlyhede
Enbrawdered the mantell
Is of yowr maydenhede.

As Kinsman, the editor of Skelton's poems points out, in addition to its "punning similarity" to Margery's name, marjoram was symbolic of "comeliness and excellence" (p. 196). He quotes information from The grete herball that it "comforteth the brayne" and that the powder taken in meats or warmed in wine "warmeth the colde stomake and comforteth dygestion". Turner's advice is much more prosaic. After saying it has "a very good savour", he continues: "The broth of thys herbe dronken is good for the dropsye in the begynnyng, and for them that can not make water, and for the gnawing in the belly." The closest Turner gets to suggesting a comforting quality is his recommendation that the oil made of merierum gentle "warmeth and fasteneth the synoes" (Herbal Part 1, p. 22).

In Skelton's poem, the primrose suggests the girl's youthfulness, perhaps derived from the mediaeval Latin "prima rosa," the "first" or "earliest rose" of the spring (O.E.D. "primrose"). As Grigson says, it is not easy to tell in early literature, whether the "primrose" referred to Primula vulgaris or Primula veris, today's primrose and cowslip respectively (Grigson, p. 287).

The columbine had from Chaucer's time and earlier been a flower associated with simplicity and gentleness.

These were virtues supposedly observed in doves and pigeons and it was thought that the inverted flower of this plant (now officially called by the generic name Aquilegia) had some resemblance to five pigeons clustering together (O.E.D. sb^2 1). Alternatively, Grigson says that Columbine was believed in the middle ages to be the food of lions (perhaps because doves were the sacred birds of Aphrodite and her counterpart Astarte, both associated with lions). Rubbing Columbine on the hands gave one the courage of a lion (Grigson, p. 52). Turner suggests a more practical use: "the sede of Columbine brused and with a halfpennye weight of Saffron dronken with wine is good for the yelow jaundies ... it openeth the wayes of the lyver of whose stopping arise many deseases" (Herbal Part 3, p. 7).

Doubtless it would be the virtues of simplicity and gentleness again which made Skelton include Columbine in another of his lyrics, "To Maystres Isabell Pennell" of which the following is a part:

My mayden Isabell,
Reflaring rosabell,
The flagrant camamell;
    The ruddy rosary,
The soverayne rosemary,
The praty strawbery;
    The columbyne, the nepte,
The jiloffer well set,
The propre vyolet;
    Enuwyd, your colowre
Is lyke the dasy flowre
After the Aprill showre;

Possibly in this lyric Skelton is not only concerned with the supposed virtues of the plants but with their scents, for all the flowers he mentions have a strong fragrance. Camamell "noted for its aromatic and curative properties" (Skelton's Poems, p. 198) derived its name from the Greek earth-apple, because of the apple-like scent of the blossoms (O.E.D. "Camomile"). Gerard wrote that it was "a speciall helpe against wearisomnesse; it easeth and mitigateth paine, it mollifieth and suppleth."[21] According to Grigson, camomile (spelt chamomile for medical purposes) is listed in the 1949 edition of the British Pharmaceutical Codex as the basis of camomile tea, shampoo and poultices (p. 402) and certainly it is still today a well-used soothing lotion for a skin irritated by hives, bites or sunburn.

Rosemary was even better known than camomile. Its fragrance is such that Banckes's Herbal advises its readers to make a box of the wood of this plant, because smelling this would be a preservative of youth! Powdered flowers of rosemary, bound to the right arm in a linen cloth "shall make the lyght and mery" (sig. $H1^{V}$), the leaves boiled in white wine give "a fayre face" (ibid.) and placed under the pillow deliver the sleeper from all evil dreams. Rosemary

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[21]John Gerard, The Herbal or General History of Plants The Complete 1633 Edition as Revised and Enlarged by Thomas Johnson (New York: Dover Publications, Inc., 1975), p. 756.

maintained its popularity, for later in the century Lyte says that the "leaves and floures are of a very strong and pleasant savour, and good smacke or taste."[22] The violet too, is recommended in Banckes's Herbal for "sore eyes" and he who binds them to his temples, after soaking his feet in violet water up to the ankles, will "slepe well" (sig. I2).

Violets, nepte and jiloffers were all strongly-scented. Violets are still used as the basis for some perfumes. Nepte was probably catmint, a kind of calamint, generic name Nepeta cataria and described by Grigson as "a sweet herb of the garden" (p. 351). Jeloffer was a name given to many clove-scented plants, though now the gilly-flower, an alternative spelling which has survived, is usually thought of as the wallflower or stock. Lyte writes of Stocke Gillofers having "wollie softe leaves" (p. 152); he also writes of Clove Gillofers (meaning carnations) "the small feathered leaves do grow rounde about, spread in compasse, whereof some be of colour white, some carnation, or of a lively flesshe colour ... and do all smell almost like Cloves" (Lyte, p. 154).

Either the young girl reminds Skelton of all those sweet-scented flowers which bring ease and balm by lifting

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[22]Rembert Dodoens, A niewe herball, or Historie of plantes translated from the French by Henry Lyte (London, 1578), p. 263.

the spirits with their fragrance, or else he is listing the best-known plants of his day, which might quite likely be those with attractive scents. Flowers have traditionally been planted in gardens - especially cottage gardens - as much for perfume as for colour. Colour is here too, in the "ruddy" rose, and the "praty" strawberry, both suggesting a warm, glowing red. It is tempting to think of "glowing" for the "flagrant" camomile, but since its flowers are white or yellow and white, the more likely explanation is that "flagrant" here means "fragrant" as the former was often used with the meaning of "sweet-smelling" at this time, the Latin verbs "flagare" and "fragare" being confused (O.E.D. 'flagrant' a. 6).

The last three lines of the extract from the poem would suggest that the girl's colouring has impressed the poet, maybe that she has the clear pink and white complexion so sought after through the ages. It would match the freshness of the daisy, suggested in these lovely lines. In this lyric as in the last, the poet reacts to the flower of the plant, or else to the overall impression of a plant including the traditional folk-lore associated with it.

On the other hand, herbalists such as William Turner, striving towards true botany, often took less notice of the overall impression of a plant. Instead, they concentrated on relating the impression various parts - the leaves,

flowers, seeds, roots - made on the senses of sight, smell and touch. One might say they were objective in the extent to which they were able to recount clear sensory impressions without subjective emotional overtones. An example might be Turner's recollection of the Cytisus tree (Broom): "The bushes were lyke lytle trees, and were as hyghe as a manne: the braunches and twygges was whytishe, and had a whyte hare on them, there growe lytle coddes in the braunches lyke unto tares: but shorter, as I remembre" (Herbal Part 1., p. 158).

The final phrase suggests Turner's recognition of the limits of human objectivity. Objectivity must have been doubly difficult for the early botanists. On the one hand they were saddled with the legacy of charm and superstition surrounding plants; on the other hand they could not counter this with the precision of measurement and the directness of cause and effect which were giving some scientific validity to astronomy and physics.

In this regard it is significant that Turner and his fellow botanists on the continent have been accused of describing the leaves of a plant more fully and carefully than other parts.[23] However, even if there was something of an over-emphasis in this area the basic instinct towards

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[23]Julius von Sachs, History of Botany (1530-1860), trans. H.E.F. Garnsey, rev. I.B. Balfour (1890; New York: Russell and Russell, 1967), p. 19.

leaves seems to have been wise. Flowers tend to elicit a much more personal response than do leaves, as scent and colour are usually so much stronger in them. On the other hand the leaves are, roots apart, the most permanent part of a plant, usually changing little over the growing season. They may make a marked impression on as many as four out of the five senses. Noted dispassionately, such impressions can go far in making for clear discrimination between one plant and the next: fine discrimination and accurate identification being, of course, the main purpose of these herbalists. Furthermore, not long after Turner completed his herbal, in fact in 1570-1571, only two years after Turner's death, Mathias de L'Obel published one of the first classifications of plants in his Stirpium adversaria nova, and this was based on differences in leaf structure which were sufficiently well observed for him to distinguish between monocotyledons and dicotyledons (Arber, p. 176). These are the two classes of flowering plants. Monocotyledons have one seed leaf in the embryo, dicotyledons have two (e.g. corn is a monocot, the bean plant a dicot). The floral parts of monocots usually occur in threes or multiples of three, those of dicots may number four, five, ten or even thousands.

The appearance of a leaf involves basically shape, size, colour and surface texture. For example, Turner

describes Henbane as having "brode leves and long, devyded, black and rough" (Herbal Part 1, p. 20). Usually this leads to consideration of finer details: for example, in the Daisy "there are smalle nykkes in the borders or edges of the leaves" (ibid., p. 63). Such indentations vary from plant to plant. In Great Hawkweed the leaves "are indented but every cutte is a greatewaye from another" (Herbal Part 2 fol. 14), but in Chinopodium "The greatest leves have a litle indentyng about the edges, but not very thyk nor orderly sett to gether" (Herbal Part 1, p. 122). With Triacle Mustard the indentations vary with the position of the leaves on the plant, for it "hath litle cuttinges or jaggynges about the edges of the leaves and speciallye of them that are nexte unto the roote" (Herbal Part 2 fol. 153).

Sometimes, despite the greatest thoroughness, Turner is not clear. For example, it is difficult to visualise his Ceterache leaves which "are indented so that one indentyng is not right over agaynst another: but agaynste every dyvysyon, cuttynge or indentyng, standeth a round halfe cyrcle" (Herbal Part 1, p. 55). Turner was evidently not satisfied with his efforts, for later on the same page he says:

> If this description can not evydently ynough declare unto you asplenon: take a branche of polipodium: and take a finger lenghte of the middes of it, the nether ende, and the high ende cut away: cut of both the sides, the toppes of the leves away, and make then the remaine round: and then shal ye see the very forme of asplenon.

He is correct in saying this is "the very forme," and his resorting to such a practical demonstration shows that Turner appreciated the limitations of his descriptive powers. For this reason perhaps he often follows the lead of the ancient botanists in likening the leaves of lesser-known plants to those of better known ones. For example, in describing English water cresses Turner considers the leaves to be "fyrst round, but after they be growen furth, they are indented lyke the leaves of rocket" (Herbal Part 2 fol. 140) and he compares Selandine leaves with those of Crowfoot, except that the former are "softer and blewish gray in color" (ibid. fol. 15). Lagopus has "roughe leaves of the form and fasshion of a clover or a thre leved grasse" (ibid. fol. 26^{v}). Sampere has "fat leves and many, and sume thynge whytyshe lyke the leves of porcelayne, but broder and longer wyth a saltyshe taste" (Herbal Part 1, p. 139); in the case of Periwinkle, the "figure and colour of the leves, are lyke unto a laurell or bay lefe, but they are lesser a great dele" (ibid., p. 120).

Though "longer" and "lesser" lack precision, Turner seems content to leave them, but when describing Lonchitis altera, he tries to clarify the comparison by using metaphor: "the gappes that go betwene the teth, if a man may call them so, are muche wyder then the cuttes that are in ceterach. And the teth are muche longer and sharper"

(Herbal Part 2 fol. 40^{v}). Presumably here "indentations" is replaced by "gappes" and "cuttes" to extend the teeth metaphor. Even today one speaks of "gaps" between the teeth or in place of missing teeth. The modern botanical term for a saw-edged leaf is dentate [i.e. toothed].

The old Greek botanists having, as was stated earlier, no technical terminology to use, relied extensively on comparisons with parts of the body or with common objects in their plant descriptions. Dioscorides in his Greek Herbal uses many similes - bags, bladders, cups, bridles, fingers, hats, feathers and fleas, as well as circular images such as wheels, eyes, bosses, shields and navels. Turner uses nothing like so great a variety, but limits himself, for the most part, to very common objects. For example, he describes Sumach leaves as "indented roundabout lyke a saw" (Herbal Part 2 fol. 115) and says Wilde Tansy "hath no other stalke, but a long thing lyke a packe threde" (Herbal Part 3, p. 4). This last term would have been very common from mediaeval times. The Oxford English Dictionary cites it from around 1199 A.D. as a "term used for tying up a pack" usually in connection with the wool trade (O.E.D. "pack" sb. 14). It describes the very thin, flexible stalk of tansy most effectively.

Other effective images are "gutters and crestes" used together to denote a deeply ridged surface, such as

that of the Peach stone - "very grete and full of crestes and gutters" (Herbal Part 2 fol. 48^{V}) - and the seed of fennel which Turner describes as growing "thick in the top wythout any coveringe, it is somthinge croked lyke a horne, the outsyde of it is full of gutters and crestes" (ibid. fol. 4^{V}). "Rowell", a word from the Old French meaning "a small stellar wheel or disk with sharp radial points, forming the extremity of a spur" (O.E.D. "rowel" sb. 1) is another effective image. Turner writes that the Lupin leaf has "V. or seven iaggers which altogether when as they are growen out have the lykenes of a ruel of a spor or of a sterr" (Herbal Part 2 fol. 43). This describes the palmate leaf well. In the earlier part of his herbal he has used the same image, with some explanation: "The herbe whyche I take to be alysson of Plini and Dioscorides, is a small herbe of a span hight: and of one small rede roote, growe many small stalkes, whyche have many rowelles as it were of spores, set in order: and at every rowell or rounde order of leves ner the tope, ther spryngeth furthe a lytle small branche, which hath floures, fruyte, and sede, the stalke is. IIII square and somthyng sharpe" (Herbal Part 1 p. 23). This probably indicated a tuft or branchlet.

It would seem as if Turner cannot take the credit for introducing the word "rowell" in connection with plants, but that he took it from the old name for Woodruff. In the

third part of his herbal are the lines: "Woodrose or wood rowel ... a short herbe of a span long four square and smal about the which growe certaine orders of leaves certayne spaces goynge betwene representing some kindes of rowelles of sporres whereof it hath the name in English" (p. 25). Finding it an effective image, Turner seems to be trying to establish it as a semi-technical term.

Aptness rather than originality often seems to have been Turner's aim, although the authors of both Herbals, Their Origin and Evolution and The Old English Herbals, Arber and Rohde, comment on his vivid description of dodder being "lyke a great red harpe stryng" (Herbal Part 1, p. 94). Although neither of these authors elaborates, it seems likely Turner would be thinking of the C string of a harp. In his day the gut would probably be dyed red to mark the note C and the effect of the coiled red gut would be very like the thin twisted red stem of dodder. Arber also feels that his likening the seed vessels of shepherd's purse to "a boyes satchel or little bagge" is a particularly happy invention, but Turner himself seems aware that he is merely explaining the local name, for he says: "Bursa pastoris is called in some places of England shepeherdes pouche, of the likines that the sede vessel hath unto a shepeherdes pouch or shrippe" (shrippe = small bag. O.E.D. "shrip" = "scrip"). Turner continues, "In the top are white floures and when they are gone there foloweth as I said before the vessel of the

sede like unto a boyes satchel or little bagge" (Herbal Part 3, p. 14). Before Turner, Banckes's Herbal had read: "BURSA PASTORIS is called shephere's-purse.... The cods thereof be like a purse" (sig. B3). The grete herball of 1526 had said that "the sede" (inaccurately for the seed vessel) "of it is lyke a purs" (sig. $E2^{V}$) and Lyte translating Dodoens a few years after Turner published his herbal, describes the seeds as being contained in "triangled pouches" (Lyte, p. 80). Gerard presents it this way: "after these" (that is, the flowers) "come up little seed vessels, flat, and cornered, narrow at the stem like to a certaine little pouch or purse, in which lieth the seed" (Gerard, p. 275). The present day Systematic Guide to Flowering Plants says tersely that the fruit of Shepherd's Purse is "a roughly triangular silicula opening by 2 valves."[24] The term "silicula" was first used in the middle of the eighteenth century to denote a short seed-bearing pod, but it would not have the immediacy for the layman that the purse images had. However, once the term was absorbed into his vocabulary the modern amateur naturalist would have a more precise term of reference to use in comparing plants.

Another image of Turner's which Arber likes (p. 153) is his simile of Dead-nettle flowers being "very like unto little coules or hoodes that stand over bare heades"

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[24]S.A. Manning, Systematic Guide to Flowering Plants (London: Museum Press Ltd.; 1965), p. 160.

(Herbal Part 2, fol. 27). Actually this one almost echoes, or is echoed by, the description found in Lyte, of the same flowers, "fasshioned like to a hoode, or open helmet" (p. 130). Although the Lyte translation appeared in England in 1578, the original Dodoens'work was published in 1554, eight years earlier than the second part of Turner's herbal in which he uses the simile. However, it does not follow that Turner read or heard the image from Dodoens, for according to J.F. Payne in his paper "English Herbals" the second part of Turner's herbal was to have been printed immediately after the first part (implying that it was ready to be printed) in 1551,[25] in which case Turner might have used the figure first.

There is little to be gained in pursuing the originality of these similes. Turner's wide reading of contemporary and ancient botanists, and also his continental travelling and visits to many famous herb gardens, must have suggested images to him which became part of his own thinking. In many cases the more unusual images are not his own. When he writes of the Bean of Egypt having seed-vessels like "the hony combes of waspes" (Herbal Part 1, p. 127), he quickly explains that this simile is Ruellius's translation from the Greek. Similarly he does not claim originality for likening cowslip flowers to bunches of keys:

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[25] J.F. Payne, "English Herbals", Bibliographical Society (Chicago) Transactions, VII (1909-11), p. 301.

"The Germans call the Cowislip Schlussel blumen, because they have a great sort of floures like keyes, growing together in the top of the littel stalke" (Herbal Part 3, p. 78). This is a good example of how an image may lose its aptness over the centuries. To think of cowslip flowers in terms of keys would be misleading to a present-day naturalist, since no modern keys bear the slightest resemblance to those flowers. However, A Gardener's Dictionary of Plant Names draws attention to a paper in Norwegian by Rolf Nordhagen which explains this. Evidently cowslip flowers (i.e. Primula veris) do resemble "a type of key ... belonging to a very old lock mechanism known in ancient Rome, probably introduced into Scandinavia during the Viking period, evidently once widespread in Europe, and probably of Asiatic invention, sometimes called a 'Chinese padlock'."[26] This particular key type has a long narrow handle corresponding to the pedicel of the cowslip, then broadens into a straight, long shank matching the long, fluted calyx of the flower. The top of the key is a broad flat metal surface cut into lobes and perforated by holes, so that it is not too unlike the petals forming the cowslip corolla. Whether Turner was familiar with the "Chinese padlock" mechanism and would have used the key image without its being suggested we cannot know, but it does demonstrate that however universal an object may be there

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[26]A.W. Smith, comp. A Gardener's Dictionary of Plant Names: A Handbook on the Origin and Meaning of Some Plant Names, rev. and enl. by William T. Stearn and Isadore I.L. Smith (New York: St. Martin's Press, 1972), pp. 344-5.

is always the danger that it may not be recognised in a few centuries' time.

Often Turner lifts his images straight from Dioscorides and usually, having withstood the test of time between the Greeks and the Tudors, they are still intelligible and explanatory now. He repeats that Groundpine has branches "bowynge in after the fasshion of an anker" (Herbal Part 1, p. 108). Goodyer in 1655 translates Dioscorides as "curved in fashion of an anchor."[27] Again, when describing Hart's tongue, Turner repeats Dioscorides almost word for word right down to the leaves having "as it wer smal wormes hangyng on" upon the back side (Herbal Part 2 fol. 86^{v}).[28] From Dioscorides, too, he takes, along with the rest of the description, the likening of gooshareth seed to a navel, though Turner uses a slightly different emphasis. Where Goodyer translates Dioscorides as "the seed hard, white, round, somewhat hollow in the midst as the navel" (ibid., p. 334), Turner has "the sede is harde rounde, some thynge holowe, and whyte in the myddes, lyke unto a navell" (Herbal Part 1, p. 39),

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[27] Pedanius Dioscorides of Anazarbos, The Greek herbal of Dioscorides, translated by John Goodyer 1655; edited by Robert T. Gunther (1933, rptd. New York, Hafner, 1959), p. 397.

[28] cf. Dioscorides, Herbal, p. 351.

suggesting that a navel is not only hollow but white-centred. Turner also repeats the Greek's tale of shepherds using this plant as a strainer to pull hairs out of the milk, but there is no way of knowing whether he had found it true of English shepherds. Gerard says: "Dioscorides reports, that the sheepheards in stead of a Cullender do use it to take haires out of milke, if any remaine therein" (p. 1122).

One of the more unusual similes which Turner takes from the Greek botanist is that of Aconitum, presumably Aconitum napellus with its "root ressembling a scorpions tayle and shining like alabaster" (Herbal Part 1, p. 7). He also borrows the term "wingwise" from Dioscorides and incorporates it very effectively in his own descriptions to explain the way certain leaves grow from their stems. Often the term is considered self-explanatory as of Dwarf Gentian leaves which Turner says are "long and stand wingwise on the stalke which is round" (Herbal Part 3, p. 25), but he describes at greater length and more charmingly Burnet, with its "thin litle leves like unto the winges of birdes standing out as the bird setteth her winges out when he intendeth to flye" (ibid., p. 10). The modern technical term is simply "opposite" leaves. Turner also uses "wingwise" negatively to describe the common Ciche about which he says he can only find "fragmentes" in Theophrastus and Pliny. He continues in this way "But I wyll describe it as I have

seene it. The comon Ciche hath a very hard stalke and some thynge roughe, and at the fyrst syght, it loketh lyke apease, but the leves are a great dele smaller and lightely indented about. There growe of every braunche twoo orders of leves, but they stand not wyngewyse, that is one ryght against another, but one higher then another [modern technical term is "sub-opposite" leaves], the braunches and the standyng and forme of the leves, ar not unlyke unto lychores" (Herbal Part 1, p. 112). Obviously "wingwise" not only indicates the flat, right-angled spread of the leaves as it did in the description of Burnet, it also suggests pairing of leaves from the stalk and thus acts as a compact and effective image. However when the image is not quite precise enough, Turner in his desire to use the idea of birds' wings, but in a modified form, finds himself involved in a long explanation, as he does when describing the mastick tree:

> the leaves of it stand in such order as the ash tree leves do, that is every one all moste ryght over in order agaynst an other, savyng that one standeth a little beneth it that standeth on the other syde. With theyr maner of standyng every payr representeth a cople of byrdes wynges stretcheth furth redy to flie and chefely then when as they are pressed furth upon a book (Herbal Part 2 fol. 34).

It seems as if Turner will not use an image unless it truly describes what he has observed, and he is only too ready to correct other writers whom he feels are less

vigilant. Thus he argues that though the ancient writers have likened the seed of Triacle Mustard to a broken dish, it is in fact the seed vessel which has that appearance (ibid. fol. 153). On other occasions he elaborates on Dioscorides, adding further images for his own clarification. For example, he says of the Houseleek: "the leaves are fatt or thyck, of the bignes of a mannes thumb, at the poynt lyke a tonge. The nethermoste leaves lye wyth there bellyes upward, and the poyntes dounwarde; but they that are toward the top, beyng drawen together, resemble a circle with the figure of an eye" (ibid. fol. 131). Here the tongue and eye images are from Dioscorides, the rest is Turner's. It seems a good description, but this is difficult to judge unless one is not familiar with the appearance of a leek!

Where his first-hand experience is extensive, Turner feels sufficiently confident to comment on very fine details which contemporary or classical authors may have missed or where he feels they were not absolutely clear. For example, Dioscorides described Alysson leaves as "round", but Turner explains that they are "in dede ... not even playne rownde taken severally by their selves, but they taken one with an other all together are rounde in order" (Herbal Part 1, p. 23).

From Dioscorides again, Turner repeats that the leaves of Medica narrow as the plant grows older, though

they start out like field clover. But, he continues, "I have marked that the lefe which standeth in the middes betwene the 11. other leves that allwayes grow about it hath a longer footstalk or stele then the rest have. And the same lefe from the goyng down of the son untill it ripe agayn foldeth it self in warde and then goeth abrode when the son ryseth agayn" (Herbal Part 2 fol. 51^{v}). It is noticeable that this close observation is recounted without images but with the technical terms "footstalk" and "stele". The Oxford English Dictionary gives this definition of footstalk: "Stalk or petiole of a leaf; the peduncle of a flower" and cites Turner's use of it in the second part of his Herbal: "A footlyng or footstalke such as chyries grow on" (Herbal Part 2 fol. 41). There are other examples in this part of the herbal. One is Petasites, described as having a "soft stele or footstalk, a cubit long and somtyme longer, and it is of the thicknes of a mannes finger, and in the top of it groweth a lefe which hath the fasshon of an hat, & it hangeth doun after the maner of a todestool" (Herbal Part 2 fol. 83). Another example is the second kind of Tribulus, which grows in water. Turner writes, "the leaves are brode, and they have a long footstalk" (Herbal Part 2 fol. 156). He uses it again in the third part of the Herbal when describing Balsamine: "The claspers [i.e. stipules] come out from the holowe place betwene the stalke and the leaves

footestalke" (Herbal Part 3, p. 16).

It is easy to see that Turner translated this from the Latin word "pediculus" meaning footstalk, because in the second part of his Herbal he uses the term "pediculo" (fol. 41^{V}) to have the same meaning as footstalk. The Latin "petiolatus" meaning "stalked", later, through the organising mind of Joachin Jung, gave us "petiole" (Arber, p. 182), specifically, "the footstalk of a leaf, by which it is attached to the stem: a leafstalk" (O.E.D. "petiole"). The stalk attaching the flower to the stem is now called the peduncle.

Turner's use of the word "stele" as used in the aforementioned description of Medica, could perhaps also be considered as the forerunner of a technical term. He seems to be using "stele" in the sense of "support" and indeed the modern non-scientific meaning is "pillar". But according to the Oxford English Dictionary a precise technical meaning for "stele" goes back less than a hundred years to 1895 when Van Tieghem suggested its use for the central cylinder (i.e. column) in plants, so that its definition today is "The axial cylinder in the stems and roots of vascular plants, developed from the plerome" (O.E.D. "stele" 2). Although it is now used in a much more precise way, the word still denotes a supportive function as it did when Turner used it in his description of Medica leaves. In a very small way, it perhaps demonstrates one of his

first steps towards a consideration of the inter-relationships between the different parts of plants, however incidental it may have been to his chief purpose of description and differentiation.

It has been explained and demonstrated in this chapter how preoccupied Turner was with leaf formation. It should be noted that not only did he describe the shape in fine detail, and the attachment to the stalk, but also the inclination of the leaves themselves. For example, he noticed aloes' leaves "bowynge backwarde" (Herbal Part 1, p. 17), but the leaves of lukken Gollande "bowynge inwarde" (ibid., p. 105). Some of the leaves of Veronica "bowe inward and beare the likeness of a gutter" (Herbal Part 3, p. 77). Presumably the curved surface causes rain water to drain off quickly. Density of leaf growth also causes comment when he writes of Venus Hair "for trichomanes even from the roote hath contynually leves unto the top, as the male brake hath, and Adiantum is bare a good waye above the roote, as the she ferne is bare even to the top, and there is it full of leves" (Herbal Part 1, p. 11).

Not only is there always a sense of the plant under close scrutiny, there are also constant references to the handling of plants. Lycores leaves are "thicke, fatt and full of gombe when they are touched" (Herbal Part 2 fol. 12); and Turner says of Brank ursine that the "hole herbe is very

sleymy and full of a sleperynuce" (Herbal Part 1, p. 7). Acanthium, too, is described as "clammy" with the interesting additional detail that "the lefe broken hath in it a longe thyng lyke cotton or fyne doune" (Herbal Part 2, p. 6). Similarly he notes with Scabious "if ye breake the leafe insunder" small hairs (presumably vascular strands) within the leaf will prevent a clean break (Herbal Part 3, p. 69). This type of handling is obviously an important part of identification. "If ye set the leafe" Turner says of St. John's wort, "betwene your eyes and the sonne ther shall appere an infinite nombre of holes in the leaves" (Herbal Part 2, p. 18). He records, too, that a St. John's Grass leaf "if it be brused wyth a mans finger putteth furth a blodi juice wherefore some have called it mans blode" (ibid., fol. 18), but Turner cannot take all the credit for this since Dioscorides had noted that in all this species the leaves and/or fruit yield a blood or wine-coloured juice (or sap) when crushed.

Not only the leaves, but other parts of plants undergo poking and probing with the fingers. The seed of Woodbine, "is harde and not easye to be plucked away" (ibid., fol. 82). In other cases it is the root which finally determines the difference between one plant and the next. For example, the first kind of anchusa, "is so like gardine buglosse, that a man can not lightlye discerne the one from

the other, savinge only by the root, whiche is very rede with out, but not with in" (Herbal Part 1, p. 31). He adds some interesting local details regarding the second kind of anchusa with its "rede rootes and longe whiche in the harvest tyme putteth furth a sanguine juice." He continues: "Thys herbe is called in some places of Englande cattys tayles, in other places wylde buglose: it groweth in gravylly and sandy places, and in pyttes, wher as gravell is dygged out of" (Herbal Part 1, p. 31).

It is these touches which give Turner's herbal an authenticity not always achieved by later herbalists. When Henry Lyte in his translation of Dodoens, describes the locality of a plant as "in this country" he is often misleading because the phrase is simply a translation from the original author and means the plant is native to Belgium, not necessarily to England. Turner is more thoughtful in this respect and though there are innumerable "cures" for snakebite and scorpion bites in the early part of his herbal, there are noticeably fewer in the third part, dealing mainly with herbs not considered by the Greeks and Romans.

One feels sure when Turner writes in the first person that he is referring to his own experiences, including not only handling but tasting. "The taste of it that I tastede in London was evidently saltyshe" he says of Orchall

(ibid., p. 171), and earlier in the same book he describes Alysson seed as being hot "when it hath bene a good while on youre tonge" (ibid., p. 23). He also brings the question of taste into his long argument on the identification of English borage with Dioscorides's bugloss. Although there are some discrepancies as to leaf size, "yet it myght be a kynde of it, seyng that it agreeth both in taste, and muche in lykenes wyth buglosse" (ibid., p. 79).

On the previous page he gave his opinion on the English version of Dioscorides's byron thalassion, with again an emphasis on taste and concluding with the description of a recipe using the herb, which he recalls from his home in Northumberland:

> The learned men of Italy have taken a lytle thynge lyke mosse, that groweth here comonly upon oysters shelles, which they call corallinum, for bryon thalassion Dioscorides: whose opinion I can not utterly repel. But I know a see herbe like moss in dede, with a taste playne astringent: whych semeth to me more like to be Brion thalassion, and the potecaries call thys herbe, usnea marina: but the other called Corrallina, is made of many lytle stony joyntes connyngly knyt together: and if ye byte it wyth your tethe, it wyll crashe under your teth: as lytle stones or gravell do. Usnea marina may be called in Englishe, see mosse, Corallina may be named in Englishe, Coralline, the bryon thalassion of Theophrastus, and Pliny, is called in Northumberland slauke: whyche in lent the poore people sette, and that with lekes and oyniones. They put it in a poot, and smore it, as they call it: and then it looketh blake, and then put they oyniones to it, and eat it
>
> (Herbal Part 1, p. 78).

Turner's arguments here are well backed up with sensory verification. Furthermore his close association with

Northumberland and knowledge of the people's ways with herbs (extending, as can be seen here, to describing in detail methods of cooking, complete with local culinary expressions) gives his writing a very practical tone which suits his scientific purpose.

As can be seen, Turner advocates a method that one might call first-hand "close-up sensory attack" as a way of acquainting oneself with plants. In addition to this, he does not omit two other important ways of learning about them, both of which demonstrate the thoroughness of his personal investigations. One is the appearance of a plant over its yearly life cycle, the other is the behaviour of individual plants over a number of years.

In the first connection he says that Anise "when it cummeth fyrst furth is rounde, and indented about: afterward: it is like unto parsely hygh up in the stalke it hath a flour and a top lyke fenell" (ibid., p. 35). Later in the same section of the herbal he warns against identifying a plant too early in its life cycle, for "I have marked that the yonge dragon when it cummeth first furth is so lyke aron that the one can not be well knowen from the other" (Herbal Part 1, p. 167). Turner stresses the importance of seeing a plant over the full growth cycle and gives the example of Soldanell: "The herbe, whiche I take to be Soldanel: when it cummeth first up, hath upon a

long stalke very round leves, almost as round, as garden folfot ... and very fat, and thick, and bytter in taste, & sumthyng saltysh with a manifest hete. The leves that cum not streight way from the rootes, as the fyrst do, but out of the stalke, are longer much, then the other" (ibid., pp. 75-76). Turner concludes that Ruellius wrongly described the leaves of Soldanell as "thyn" because he had not seen the fat leaves of the young plant. (However, it must also be admitted that Goodyer translates Dioscorides as saying Soldanell has "thinne leaves", p. 161). Years later, Turner warns similarly of Rali that "The older that the herbe is, the longer are the leaves" (Herbal Part 3, p. 37).

From this kind of patient, long-term scrutiny he has learned that laurel leaves are "blackishe grene" when old and "curled about the edges" (Herbal Part 2, fol. 32); that Juniper berries are "first grene and afterwarde blacke" (ibid., fol. 25); and that though he has "marked" Crobanche (Darnel) many years, "I colde never se any lefe upon it" (ibid., fol. 71^{v}). He also comments that in a cold year Throwwaxe seed comes much later (Herbal Part 1, p. 125).

Perhaps one of the most interesting examples illustrating the thoroughness of his observations is found in his discussion on Epimedum, a herb which Turner describes as "strange and yll to fynde":

> how be it I found a certaine herbe in Germany besyde the Byshop of Colens place: called Popelsdop, by a brokes syde very well agreeyng in all poyntes, savyng in one with the description that Dioscorides maketh of epimedum. In the moneth of July I sawe thys herbe, havyng ix. or. x. leves comyng out of an roote, very like to our march violet leves,

> in all poyntes, savynge that the stalkes that bere the leves, were thryse as long as violet stalkes be. The roote was blacke, full of joyntes and of a stronge savour, and at that tyme I coulde fynde in it nother floure nor fruyte. The nexte yere folowyng in the middes of Marche in the same place, I founde the same herbe, wyth leves, stalke and floure, lyke unto wylde valerian, and twoo handbredes from that place I found two or thre leves lyke unto violettes commyng out of the same roote, so that out of the one end of the roote came leves lyke violets, out of the other ende leves, stalke, and floures lyke Valerian. But Dioscorides describeth hys Epimedum thus. It hath a stalke not greate, wyth leves lyke yuy. [yew] .x or. xii. together, and it bereth nother floure nor frute the roote is blak, smal and of a strong savour, wyth an unsavery tast. It groweth in moyst places. It appereth by thys description yf thys be trew epimedium, as I do take it to be, that Dioscorides sawe not thys herbe in Marche: but in July or aboute that tyme, but here I wyll gyve no occasion to other more dyligently to seke thys herbe. If they can chaunce upon it.
> (Herbal Part 1, pp. 179-180).

One has to admire Turner's persistence as it is revealed through this rather artless description of plant-hunting, interspersed as it is with his reasoning and his looking to Dioscorides for authority, balanced against the evidence of his own senses. The last sentences indicate the true scientific spirit, that the matter is by no means closed as far as he is concerned, but that he will welcome others continuing the investigations - providing they can find the plant, he adds with a touch of typical Turner irony.

The suggestion that others might improve on his findings if they are diligent and observant is reiterated throughout the herbal. If one reads through from the early Libellus and Names of Herbes to the third part of the Herbal, it becomes very obvious that Turner rarely accepted his

knowledge of a plant as complete. As time passes additional points are noted. For example, in the case of Horned Poppy, Turner writes in Names that it "groweth in Dover clyffes" (sig. F1). By the second part of the herbal in 1562, he adds "Also in Dorsetshyre" (Herbal Part 2, fol. 77). Similarly he writes in Names of the Everlasting Pea "I have sene thys herbe of late in Coome parke" (sig. B4) and later in the herbal "And on Rychemonde heth" (Herbal Part 1, p. 56).

Part 3. Turner's prose as practical rather than poetic.

Turner's acquaintance with the life cycles of plants rarely, however, gives a poetic sense to his herbal such as one finds in Henry Lyte's A Niewe herball (1578). This translation from the French Histoire des plantes was itself Charles de l'Ecluse's translation of Dodoens's Flemish Cruÿdeboeck, but the spirit of Lyte's version is considered to be very close to the original. This herbal is permeated with the sense of growth and change in a plant's life cycle; for example, in the description of the Lesser Clote: "in the middle of the Burres, there groweth forth as it were a little Crownet, somewhat above the Burres, upon which groweth small floures, the which do perish after their opening, and do fall with their Crowne" (p. 15). This sense of the fleeting life of the flower and, to some extent, of the plant as a whole, is typical of the Lyte herbal. It gives something of the feeling of time lapse photography to read of Golden Stonebreake: "At the toppe of the stalke growe two or three littell leaves togither, and out of the middle of them springeth small floures, of a golden colour, and after them, little round huskes, full of small redde seede, and they open and disclose themselves whan the seede is ripe" (p. 288).

The short, direct phrases linked by "and", together with the strong simple verbs of movement - "growe,"

"springeth," "open," "disclose" - give the impression of continuous vitality, of the plant as a living thing, enjoying life. Turner does use some of these same verbs; for example he says of Adder's Grass that: "The stalke is a span longe, oute of whyche sprynge purple flowers" (Herbal Part 1, p. 157), but he does not have the same recurring pattern of verbs which produces the sense of a complete life cycle. It is tempting to think that Turner's descriptions are more packed with facts - for example, the "span" length, here. But Lyte incorporates measurement into his descriptions, too, including that of the span. Folefoote, he writes, has a stem "as it were cottoned with fine heare of a span long, at the end whereof are fayre yellow floures and full, which do suddenly fade, and chaunge into downe, or cotton, which is carried away with the winde, like to the head of Dandelion" (p. 20). It is, of course, the stem, not the hair which is a span, or approximately nine inches long. But one gets the impression that Lyte, or more accurately Dodoens, the original writer, is less concerned with the measurement than with the part played by the wind as an agent of change in the appearance of the plant. The wind occurs often in this way in the Lyte herbal. One reads of Sterrewurt that "the plume is carried away with the wind" (p. 36); that the "cottony substance" of Willowherb "is carried away with the winde"

(p. 73); and that the second kind of Hemp has small white flowers "the whiche like duste or pouder is caried away with the winde" (p. 71).

This does have scientific value in that it shows the type of seed dispersal for these plants. Turner occasionally mentions flowers turning into down, but without that sense of the life force which is so evident in the Lyte herbal. For example, when Turner says of Gum Succory "in the top of every braunche is a yellow floure, which when it fadeth is turned into whyte downe" (Herbal Part 1, p. 109), this is not very different in substance from Lyte's description of Flebane, whose yellow flowers "chaunge into Downie heads, fleeing away with the wind" (Lyte, p. 34). However, Turner's use of the passive tense "is turned" compared with "chaunge" and "fleeing away" prevents his plants having the vitality, the independent life of their own which the Lyte's plants have. Turner usually mentions "down" when he has something to add which may differentiate the plant from another. He describes the brief life of the flowers of Groundsel which "shortlye ryse and wyther into doun", emphasising the earliness of the seeding with the reiteration "the floures after the maner of heare waxe hory in the spring of the yeare" (Herbal Part 2, fol. 132). And indeed, because it comes so early it is the "downiness" which makes Groundsel so

well-known and easily recognised by the layman. People have gathered it as a treat for their caged birds for years.

Again, when Turner mentions "downe" in his description of the Cat's Tail, he is differentiating this plant from others. He says that the stalk "hath in the top a thyck floure set roundaboute wyth a rough thynge, whych is turned into a downe, whyche som call panniculam in Latin" (ibid., fol. 159^{v}). Panniculam at this time was used roughly to mean a covering. By the time that Nehemiah Grew was writing in 1671, its use had become more specific: "Every bud, besides its proper leaves, is covered with divers Leafy Pannicles or Surfoyls." The Oxford English Dictionary defines this as "A membranous covering in plants, as the scales investing a leaf-bud" ("pannicle" 2). Modern botany has taken the word, spelt "panicle", to describe a compound inflorescence, that is, an inflorescence which branches irregularly, such as the bramble (O.E.D. "panicle").

Unlike Turner, Lyte makes us aware of the attractiveness of the blooming and fading of plants and this undoubtedly comes from Dodoens who in his Pemptades of 1583 describes the flower as "the joy of trees and plants, the hope of fruits to come" (Arber, p. 155). A sheer delight in plant life is evident in Dodoens's writings as one reads them translated by Lyte and Gerard. It is true that the end of the annual cycle is often emphasised, as

in the case of Butter Burre, whose flowers bloom "as it were clustering thick together"; but (the description continues) "the which togither with the stalke do perish and vanish away" (Lyte, p. 21). But as often as one finds the fading, dying and perishing ending a description, one finds a sense of rebirth, regrowth. For example, on the very first page of the Lyte herbal, the leaves of Sothrenwood which "perish and fade" in winter, "renew and spring againe in Aprill" (ibid., p. 1). The Tutsan root yearly sends forth "new springs" (ibid., p. 66), and Wallwort or Danewort is described as "an herbe that springeth up, every yere a newe from his roote" (ibid., p. 379).

As with the flowers turning into down, Turner seems to think the renewal of plants too common for comment for the most part, and reserves "spryngeth" to indicate something which rises in a noticeable way. For example, he says of Alysson that "at every rowell or round order of leves ner the tope, ther spryngeth furthe a lytle small branche, which hath floures, fruyte and sede" (Herbal Part 1, p. 23).

Turner does not use his verbs to give the same sense of life and growth that one finds in Lyte. In the latter herbal many roots and stems are described as "creeping." The Germander root goes "creping under the

earth, here and there" (Lyte, p. 24); and the stems of the second kind of Crowfoot creep on the ground "never mounting or rising higher" (ibid., p. 94). Periwinkle "hath many small and slender long branches with joyntes, wherby it spreadeth abroade uppon the ground, creeping and trayling hither and thither" (ibid., p. 94). Turner's description of the same plant is as follows: "Perywynkle ... crepeth upon the grounde very thyke, one branche wovene about an other" (Herbal Part 1, p. 22). Not only is the writing more compact, but the use of "woven" emphasises concisely the density of the plant, at the same time as it reinforces the idea of a plant. Phrases such as "creeping and trayling hither and thither" which are used in the Lyte herbal suggest the continuity of plant growth and tend to make the reader feel more subjective about the plants themselves. This is even more true on reading the description of the seed of the "Noli me tangere" Mercury, for "being ripe, it spurteth and skippeth away, as soone as it is touched ..." (Lyte, p. 76). This has a childlike quality about it which captures the movement perfectly, but can hardly be called objective reporting. Similarly Lyte writes of Sowbread flowers that they "hang upon tender stalks, nodding or beckning downewardes ..." (p. 330). Turner has little of this poetic quality. After giving Dioscorides's description of Sowbread he is more concerned

with comparing the leaves of the German and Italian varieties. It is interesting to discover that when Turner approaches Lyte's kind of description - as, for example, when he writes that Chokeweed "claspeth" about broom roots "lyke a dogge holdyng a bone in hys mouth" (Herbal Part 1, p. 178) - he is, in fact, quoting Dioscorides.

It has been suggested that much of the vitality of the Lyte herbal comes from the liveliness of the verbs, only a small proportion of which are used by Turner in his work. In Turner, the vitality arises when he is disagreeing with another botanist's description of a plant, or identification of a plant. For example, when Turner is discussing Goat's Beard, he concludes that the text of Dioscorides which he is using has been corrupted in translation, for it reads in part: "out of the stalke cummeth furth a greate hede in whose top is blake sede or fruite wher upon it hath the name givene" (Herbal Part 1, p. 62). Turner recognises that there must have been an omission between the words "fruit" and "wher upon" and his indignation at this description having been accepted for that of Dioscorides is natural and lively: "for I thynke that he wolde never say that thys herbe shuld be called Bukkis bearde because it hath a blake sede or fruite, for what hath a whyte fruite or a blake, to do with the lykenes of a bukkes bearde - nothyng at all" (ibid.).

As Grigson points out in The Englishman's Flora (p. 422), the beard is the long silky pappus, pappus being the modern botanical term for the feathery downy hairs seen on some fruits, such as those of Thistles and Dandelions. This is the "down" so often mentioned by Lyte, as the word "pappus" was not used as a scientific term in England until the beginning of the eighteenth century. Agnes Arber reports Fuchs as including it in his glossary of technical terms in his Latin herbal, De historia stirpium (1542). She translates as follows: "Pappus, both to the Greeks and to the Latins, is the fluff which falls from flowers or fruits. So also certain woolly hairs which remain on certain plants when they lose their flowers, and afterwards disappear into the air, are pappi, as happens in Senecio, Sonchus and several others" (p. 152-3). Senecio (presumably meaning "old man"), is an alternative name for Groundsel according to Grigson (p. 391). Turner was fully aware that the name of the plant, Goat's Beard, came from the exceptionally long silky "down" attached to the black seed and that this constituted the omission in his Dioscorides. He goes on to give a first hand description: "About London I have sene in the feld thys herbe wyth a swete roote and wyth blake sede and a yellow floure and after the floure is gone with a great dele of longe whyte doune lyke tuftes of whyte here" (Herbal Part 1, p. 62). Even here where it

is obviously important to his argument that he mentions the down, there is no reference to the wind blowing it away. Any cyclic sense of the plant's life is spoiled by his describing the black seed before the yellow flower.

Although Turner must have enjoyed his walks and observations, one assumes this pleasure rather than detects it from his writing. Only very occasionally indeed does he comment on the attractiveness of a plant as he does in the few lines on Wintergreen: "The stalke is longe and smal, and in the toppe of it are floures growynge which are pleasant to loke to, muche lyke the floures of Lilium convallium" (Herbal Part 3, p. 59). The reference here is to the small Lily-of-the-Valley, not the more showy Easter lily.

For this single use of the subjective word "pleasant" by Turner, one finds dozens in the Lyte herbal. Borage is described as "bearing fayre and pleasant floures in fashion like starres" (Lyte, p. 11); the third kind of Storks Bill has flowers "of a pleasant light redde" (ibid., p. 45); and Floure Constantinople flowers "be very pleasant and delectable to looke on" (ibid., p. 157). Other descriptions are even more complimentary and subjective - "poynted like to some prety pellots or buttons" (Water Betony seed, p. 42); "none more beutiful in colour ... of a blew ... so cleare and excellent, that they seeme to passe,

the azured skies" (of Autumn Belfloure, p. 172); and the flowers of Christ's Herb, "the bignesse of a grote, or shilling, of a faire colour as white as snow, having in the middle many short, tender and fine threddes, tipte with yellow" (ibid., p. 350).

It is noticeable that most of these emotional reactions are to flowers and in many cases the petals themselves are described in loving detail. For example, the small, white flowers of Eyebright are "sprincled and poudered within, with yellow and purple specks" (Lyte, p. 39). One feels that Turner could be as observant as this if he so wished, but that in fact, when he does make reference to flowers, it is because of some unusual attribute, rather than their beauty. For example, he says of Woodbine "The flour is white like the faba floures ... somthyng round, as thoughe it leaned down toward the leaf" (Herbal Part 2, fol. 82), and comments on that kind of Satyrion in which the "floures grew very thyck together, as they were writhen about the stalcke", that it blossoms later than any other kind, except ladies traces (ibid., fol. 128^{V}). Similarly his observations on colours are often to correct another writer, as when he says of Meadow saffron "the floure of thys herbe is whyte blewyshe and not whyte" (Herbal Part 1, p. 126); or of Antirrhinum "the floures before they open are like purple indede: but not afterwarde" (Herbal Part 1,

p. 38). Sometimes Turner is anxious to describe an unusual colour accurately, such as when he writes of Self-Heal: "the eare hath first in it purple floures and afterwarde broune litle leaves where the floures were, and the floures that were purple before when they fayd waxe done in color" (Herbal Part 3, p. 61). "Done" would now be spelled "dun" and means "a dull greyish brown, like the hair of the ass and mouse" (O.E.D. "dun" sb '1). The description seems to indicate that Turner is not satisfied with the broad range of colour suggested by "brown" and so particularises the shade as "dun".

The "leaves" refer of course to the leaves of the flower, which today are called petals, but Turner did not have this word at his disposal. According to Arber (p. 152), it was suggested by the Italian botanist, Fabio Colonna, or Fabius Columna, as he is more generally known, in 1592, and defined as "floris folium". The Oxford English Dictionary records its accepted use from 1649 (O.E.D. "petal"). Today "petal" means each of the divisions (which are in fact modified leaves) of the corolla of a flower.

It is interesting to compare one of Turner's plant descriptions, and particularly his description of the flower, with those of other herbalists. In Trevisa's translation of De Proprietatibus Rerum some of the most attractive lines are Bartholomoeus Anglicus's writing on the Lily.

He describes the plant with economy and delight: "The Lilye is an herbe with a white flour, and though the leves of the flour be whyte, yet withinne shyneth the liknesse of gold."[29] Banckes's Herbal gives no description of the lily at all, just lists its medicinal properties and tells how to make ointments from it ($D3^{V}$). The grete herball (1526) too is somewhat pedestrian concerning the lily: "There be lyllyes that have reed floures.... Others have yelowe floures. And the tame have whyte floures" (sig. $N5^{V}$). "Tame" in this period simply means "cultivated" and is still sometimes so used today. Apart from the information that there are several kinds of lily, this is no advance on Bartholomoeus Anglicus. In fact, it is not so effective because it does not present, as he does, that essential glowing quality which comes from the gold of the stamens. The grete herball is not so much concerned with description as with the advice that powder from the root of wild lilies may be used to "make good colour in the face" (ibid.). One knows better than to expect beauty recipes from Turner. At one point he allows that some women use marigold flowers "to make theyr here yelow," but he cannot refrain from adding "not beyng content with the naturall colour which God hath given them."(Herbal Part 1, p. 85).

This is Turner's description of the Lily: "the flour is excedyng white and it hath the forme or fasshion

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[29]Bartholomoeus Anglicus, On the Properties of Things, trans. John Trevisa, 2 Vols. (Oxford: Clarendon Press, 1975), II, 980.

of a long quiver, that is to say, smal at the one end and byg at the other. The leves of the floures are full of crestes. The overmost ends of the leves bowe a litle backwarde and from the lowest parte within come furth long small yelow thynges lyke thredes of an other smell then the flours are of" (Herbal Part 2, fol. 38).

These lines are full of significant detail. The quiver image is apt and, if it were not, it is followed by a clarification. The ribbed nature of the flower caused by the petals being joined to form the corolla is suggested by Turner's "crestes", though maybe "yelow thynges lyke thredes" is hardly a strong enough simile for the bold orange-yellow stamens. Typically, Turner seems more concerned with the fact that they have a distinctive smell, different from that of the rest of the plant, and this is certainly an important point in identification.

The lack of precise terminology hampers Turner, somewhat, as in the case of the "thredes", but one must remember that thread in the sixteenth century was much coarser than it is today, when most people have not even seen cobbler's thread. Not having "petal" to use, Turner says "the leves of the floures" which in fact, botanically speaking, is not incorrect, since the petals are modified leaves. However, it makes for possible confusion in the next sentence when "the ends of the leves" might be taken to mean the plant's actual leaves, rather than the petals,

to which in fact, he is making further reference. The keen and discriminating observation which adds that different sensory impression at the end is indicative of Turner's objective detachment. He makes no comment on the attractiveness or otherwise of the smell of either flower or stamens.

The objectivity again of Turner's "excedyng white" is evident in comparison with Lyte's reaction to the flowers - "pleasant, beautiful, white and sweete smelling Lillies." Lyte's account is detailed and, in the matter of the stamen, maybe better than Turner's. Like Turner, Lyte concentrates on the flower, observing it as "of an excellent shynyng and pure white colour, bending somewhat backwardes at the top, in the middle amongst these leaves, ther hang upon sixe very smal stems, sixe smal yellow pointes or litle markes, as it were tongues, in the middle amongst these also, there groweth another long upright and triangled stem, thicker then the rest, and lyke to the Clapper of a Bell" (Lyte, p. 200). This is good, particularly in its discrimination between the stamens and the style, and the apt comparison of the stigma with the thickened top of a bell clapper. But it does miss the two individual and significant features of the ribbed petals and the unusual scent of the stamens.

It contains too, that overworked and emotive Lyte adjective "shynyng," which Turner seems to go out of his

way to avoid, as if sensing its subjective overtones. For example, in considering Dioscorides's description of a chrysanthemum flower, Turner translates the Greek as "wonderfully shynynge yellow" (Herbal Part 1, p. 110), which would seem to be a fair translation, as Goodyer, approximately a hundred years later has "yellowish flowers, strongly shining" (Goodyer's Dioscorides, p. 449). Yet Turner gives his own description as "yellow floures and wonderfully bright" and even the use of "wonderfully" is more subjective than usual. He uses it very rarely and then to describe some really exceptional quality. One of the other few instances is his recollection of the "wounderfull great Cole" seen at Dover (Herbal Part 1, p. 75). Turner is very sparing of adjectives which reveal any emotional response to a plant, and it would seem as if, for him, "shining" falls into that category.

Lyte uses "shyning" again and again, not just about flowers, but about the gloss on the stems of Greater Chickweed which "be through shyning, and somewhat redde about the joyntes" (Lyte, p. 50); about the seed of flax "large, fatte and shining" (ibid., p. 70); and fleabane, whose flowers change into "browne and shyning seede ... like unto fleas" (ibid., p. 103). This emphasis on colour and gloss is probably best shown in the lines on the Peonie, for when the husks are ripe "there is to be seene, a faire,

red-coloured lining, and a polished blacke shining seed, full of white substance" (ibid., p. 337). It is interesting to compare this with Turner whose descriptions often contain colour, but with the implication that other sensory reactions are equally, and maybe more, important. He writes of Balsamine that it "hath a sede inclosed in ... covered with a thick shell very slippery and red" (Herbal Part 3, p. 16). Here the colour seems definitely subordinate to the thickness and texture of the covering as far as identification is concerned.

Maybe it is the sense of glorious technicolour which made Lyte's herbal so popular, and also the fact that it is more neatly organised than Turner's work. Species, description, localities, names in languages ancient and modern, then the medicinal virtues, are given in this order for each plant. It was such a marked improvement over earlier herbals that it was copied by Gerard and Parkinson in their herbals of 1597 and 1640 respectively.[30]

Gerard's herbal, though he did not admit it at the time, was largely Rembert Dodoens's Pemptades translated, and it attained an even greater popularity than Lyte's

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[30]Eleanour Sinclair Rohde, The Old English Herbals (1922; rpt. New York: Dover Publications, Inc., 1971), p. 139.

herbal had done. This may have been due, as Arber says (p. 130) to its clear Roman type, in contrast to the black letter of Turner and Lyte, but its attraction for the layman was probably due to the charm of its style. Since some of it stems from that sheer delight in plant life which is found in the Lyte herbal, it is difficult to assess how much is the spirit of Dodoens (also Lyte's source) and how much is original Gerard.

As C. E. Raven explains in English Naturalists from Neckam to Ray, there are glaring examples of scientific inaccuracy in Gerard, but it would seem that, for the non-scientific reader, these are more than balanced by a felicity of phrase and an entertaining philosophy. Even his descriptions of the localities of plants often have a poetic touch. For Eyebright to grow "In dry medows, in greene and grassie wayes and pastures standing against the Sunne" (Gerard, p. 663) has overtones of pleasure derived from the happy but by no means essential alliteration. Turner does not give the locality of this plant, being more concerned with its curative properties for the eyes (Herbal Part 3, p. 30) but one might compare it with a locality he does give, that for Daucus or rough saxifrage about which he writes: "It groweth in dry and sandy meadows, and in sydes of hylies, that are sandy or stony" (Herbal Part 1, p. 163). One might describe this as alliterative

too, but it is much blunter, more concerned with the soil conditions favoured by the plant. Despite the words "meadows" and "hylies", it does not conjure up the plants in their rural setting as picturesquely as the lines of Gerard. Gerard undoubtedly has poetic touches which Turner lacks.

On the other hand in many cases he has the same kind of precision about where he found plants as Turner does. He says, for example, that he found Allium sylvestre "in the fields called the Mantels, on the backside of Islington by London" (Gerard, p. 179). Such first hand details as well as, like Lyte, a somewhat exaggerated attention to colour, made Gerard a popular author in his own time and he continues to exercise a fascination today. Maybe this is because he delights as he instructs, the art so well appreciated and discussed by Sir Philip Sidney. The inaccuracy of some of his facts is overlooked by many readers because of the felicity of his style and the charm of his advice. The author of The Old English Herbals realises this when she comments:

> One reads his critics with the respect due to their superior learning, and then returns to Gerard's Herbal with the comfortable sensation of slipping away from a boring sermon into the pleasant spaciousness of an old-fashioned fairy-tale. For the majority of us are not scientific, nor do we care very much about being instructed. What we like is to read about daffodils and violets and gilliflowers and rosemary and thyme

> and all the other delicious old-fashioned English flowers. And when we can read about them in the matchless Elizabethan English we ask nothing more.
> (Rohde, pp. 98-99)

This sums up not only the opinion of many laymen, but of some scientists too, who forgive Gerard his shortcomings because he is entertaining to read. Consciously or unconsciously, Gerard intends to entertain his readers in a way which Turner does not, and this can be seen very clearly in the different names each of them created for various English plants.

Turner's Libellus (1538) and his Names of Herbes (1548) contain the first records "of the occurrence in England of some 238 species of flowering plants" (Facsimiles, p. 3). Exact localities are given for many of these. For example "Cammomyle ... groweth on Rychmund grene and in Hundsley heth in great plentie" (Names, $B1^{V}$) and "Absinthium marinum ... is plentuous in Northumberlande by holy Ilande and in Northfolke beside Lin" (Names, $A4^{V}$). In these two small books many English vernacular names which had originated during the Middle Ages, including Daffodil, Sauce Alone, Yarrow, Horsetail and Horehound were set down in print for the first time by Turner. He also recorded local plant names he had heard in Northumberland, East Anglia and Yorkshire, and continued to do this throughout his herbal. Thus one learns that men in Northumberland call the daisy "a banwurt" (Herbal Part 1,

p. 63); that Butter-bur is "called about Morpeth Eldeus [misprint for Eldens]" (Names, F2), and that Cowslips have three different names: "Coweslippe ... there are two kindes of them ... one is called in the West contre of some a Cowislip and the other an Oxislip and they are both call[ed] in Cambridge shyre Pagles" (Herbal Part 3, p. 80).

Turner also mentions the name Alleluya for wood sorrel, so called, according to him, because "it appereth about Easter when Alleluya is song agayn" (Herbal Part 2, fol. 74). Evidently this name has been traced to a thirteenth century Latin herbal by an Italian Monk, Rufinus of Genoa, who said that herb-gatherers supplied the plant under that name to the druggists of Bologna for making a cooling syrup. Sprague, who traced the name, says "the wood sorrel flowers in April and May, and a liturgical hymn, each verse of which ends in Alleluia, is sung daily during the Office of Compline from Easter Eve to the Saturday in Whitsun week, that is during April and May. Hence the name Alleluia" (A.W. Smith, A Gardener's Dictionary of Plant Names, p. 343).

Although Turner does not recount the background to that name in so much detail, he does mention another plant named for religious connotations: Orobanche, named by Turner Chokefich or chokewede because the Greek name means "choking", is called in Morpeth Newchappell floure "because it grewe in a chappel there in a place called bottel

bankes, where as the unlearned people dyd worshyppe the Image of Saynt Mary, and reckened that the herbe grewe in that place by the vertue of that Image" (Herbal Part 1, p. 178). Although he faithfully recorded such names, Turner did not approve of them and often tried to supplant them by names he translated from ancient or continental languages which had some reference to the plant's appearance or practical use. In this instructive spirit he tried to change the name Soloman's Seal to "whyte wurt" from the Dutch "for so shall men lern better to know it, and to remembre ..." (Herbal Part 2, fol. 98). It seems a poor substitute and fortunately was not adopted. Nor was he successful with changing Cat's Tail to "rede-mace", suggested by him because "boyes use it in theyr handes in the stede of a mace" (Herbal Part 2, fol. 159^{v}).

He gives three alternative names for Kali, all based on practical association - Saltwurt, because of its saltish taste; Glaswede, because its ashes serve to make glass; or Sea thrift because it resembles thrift (Herbal Part 3, p. 37). Gerard called it Glasswort and so it is still called. Turner never fails to follow up a suggested name with sound reasons. Acanthium he calls "Ote thystell or cotton thystell ... because the sedes of the herbe are lyke Otes and the leves brokene resemble cotton" (Herbal Part 1, p. 6), and he recommends Peaserthnut for the plant

now called Bitter Vetch "because it hath leves lyke a lytle peese, or a ciche, and rootes lyke an erthnut" (ibid., p. 56). If Turner had his way, our Shepherd's Needle would be the duller "corne Chervel" (Names, G1), but fortunately Gerard offered the alternatives of Ladies combe or Shepheard's Needle, the latter simply being a translation of the apothecary's Acus pastoris (Grigson, p. 227). As Gerard says, after the flowers "come up long seeds, very like unto pack-needdles, orderly set one by another like the great teeth of a combe" (pp. 1040-1).

Turner's translations are fairly prosaic - Swallowurte and Wintergrene from the German, and he tries Dogge stones from the Dutch for Meadow Saffron. He suggests "herbe Gratius or horse werye or werye horse" from the Italian Stanka cavallo, for what is now Gratiola (Herbal Part 3, p. 33) and he conceded that the Anemone might be called "wynde floure" (since the Greek name means to open only when the wind blows), but his first suggestion was "rose persely: because ther groweth a flour like a syngle rose in the tope of thys herbe, which is very like perselye in the leves," (Herbal Part 1, p. 32). One of his happiest translations is from the German botanists, Braunschweig and Bock. He renders their Amara dulcis (for Woody Nightshade) as Bittersweet. But this of course, did not require any imagination on Turner's part, it was simply a matter of direct translation.

One of the very few instances of imaginative name-coinage by him is for Lysimachia: "Lysimachia is of two sortes. The one is described of Dioscorides, and it hath a yealowe floure. Some cal it Lysimachiam luteam, it groweth by the Temes syde beside Shene, it may be called in Englishe yealow Lousstryfe or herbe Wylowe. The other kynde is described of Plinie, and it is called Lysimachia purpurea, it groweth by water sydes, also and maye be called in Englishe red loosstryfe, or purple losestryfe" (Names, $E2^{V}$). According to Grigson (p. 289) Loose-strife is a translation of the Greek "lusimachion" which means "ending strife", there being a belief that the herb ended strife between horses and oxen yoked to the same plough. However, Pliny held that the plant was named for Lysimachos, King of Thrace. Turner's alternative name of herbe Wylowe was after the willow-like leaves and in fact it was this name which was reversed by Lyte and Gerard to give the well-known Willowherb.

Gerard undoubtedly had an ear for an attractive name. It was he who suggested Traveller's Joy for Clematis vitalba which grows along the ways and hedges, the highway of travellers in his time. However, this sensitive ear often led him into suggesting names which Turner would have deplored because they gave an erroneous impression. For example, Gerard called the plant Filipendula ulmaria Queene of the medowes, Medowsweete and Medesweete of which

the middle name was adopted. But in fact it is not really a meadow plant at all, at least not of the dry sunny fields which the word "meadows" brings to mind, and Turner's Medewurte is more accurate in that the herb was used for flavouring mead (p. 154). Not quite such a false impression, but one harking back to sympathetic magic, is given by the Lyte and Gerard names of Adderwort and Snakeweed for Bistort. Turner's translation of "twise writhen" sounds awkward, but one feels he would be happier with Bistort suggesting the curved rhizome, than with its being likened to a coiled snake. He makes no mention of its property of curing snakebites, but says that the juice, powder and broth are good "for lose téth and rotten gummes, wherfore they are good for the disease whiche is called of the low Duche men the Scourboke, and of the Northren men at this day the scrubye ill" (Herbal Part 3, p. 13).

Another plant name which adds delight to the language without giving information about the plant is Lily-of-the-Valley. As Grigson says (p. 430), Turner in his Names did not know of Convallaria majalis as a wild plant in Great Britain, but wrote: "Ephemerum is called in duch meyblumle, in french Muguet. It groweth plentuously in Germany, but not in England that ever I coulde see, savynge in my Lordes gardine at Syon. The Poticaries in Germany do

name it Lilium convallium, it maye be called in englishe May Lilies" (Names, C8). According to Grigson, by Lyte's time the Latin name had become "pleasantly corrupted" to "liriconfancy" (p. 430), and Lily-of-the-Valley grew from that, to be the name given by both Lyte and Gerard. It grows now plentifully through most parts of England, but by no means exclusively in the valleys.

In whatever way they have come about many plant names which Turner might have frowned upon have been adopted into the English language and one would not like to see them disappear. Fortunately there is no need for them to do so, because Turner stood at the crossroads in writing his herbal. Although other herbalists came after him - Lyte, Gerard and Parkinson in the next century - all intended to entertain as they instructed. Turner intended to instruct, and his true successors were John Ray and Linnaeus, who were botanists rather than herbalists.

Turner wrestles with a lack of accurate terminology throughout the three parts of the herbal and his makeshifts are enlightening. It has already been said that he limits his similes to common objects. For measurement he follows Dioscorides in using the span - "busshye stalkes of a spane length" (of Petywhyne, Herbal Part 1, p. 36); or the cubit - "a stalk of 11. cubites hygh (Marrish mallowe, ibid., p. 21). These are closely followed by the finger - "a longe roote,

tarte, and of the bygnes of a finger" (Mullen, Herbal Part 2, fol. 161), and the thumb - "the leaves are fatt, or thyck, of the bignes of a mannes thumb" (Houseleek, Herbal Part 2, fol. 131). Palma Christi leaves are likened to "a mannes hande with the fingers stretched out" (Herbal Part 2, fol. 116), but here it is more a matter of appearance than size and one must always be on the alert for this in the old herbals. However feet - "The stalk is a fote and a halfe long ..." (bastard saffron, Herbal Part 1, p. 124), and inches - "a stalke of a cubyt long, and an ynche thycke" (Bean of Egypt, ibid., p. 127) together with the older measures of cubit and span are used to give a fair exactitude.

Angularity is also comparatively easy to express in simple geometric terms. The stalk of Cicerbita is described as "full of corners and hollow wythin" (ibid., p. 111) and the description of Alysson includes "the stalk is 1111. square and somthyng sharpe" (ibid., p. 23). In this Turner is completely modern. His description of the stalk of Calamynte as "foure square, and all roughe wyth a whyte here" (ibid., p. 82) matches the basic details given in such a layman's guide as The Oxford Book of Wild Flowers. Here one learns that the Labiatae or Deadnettle family, to which Calamint belongs, "all have square stems"

and that the Common Calamint "stems and leaves are hairy".[31] Even angularity presents problems, however, when it is not constant as the plant grows, so that Turner has sometimes to qualify an original clear statement. He describes Segge leaves this way: "as they cum out fyrst, are three square; afterwardes they do go abrode and represent a long small knyfe, but not wythout certayne squares" (Herbal Part 1, p. 93). This is a very good description, except that today one would use "edge" where Turner uses "square." Obviously he does not consider that "square" indicates a 90° angle, but rather some angle between 0° and 90°, because he says of the Wild Leek that the "vessell that holdeth the seed is 111. square" indicating the edges of the three-valved capsule. Describing the leaves, he abandons the geometric adjective in favour of a metaphor and writes simply that it has "Blades rather than leaves, varying with the growth position" (ibid., p. 80).

Not so many years after Turner's death, in 1587, Joachim Jung was born. He moved the detailed description of leaves an enormous step forward by distinguishing between simple and compound, pinnate and digitate, paripinnate and imparipinnate, opposite and alternate. He also coined terminology for various parts of the plant. In addition to

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[31] S. Ary and M. Gregory, The Oxford Book of Wild Flowers (Oxford: University Press, 1965), p. 216; p. 144.

"petiole" mentioned earlier in this chapter, Jung was responsible for "perianth", "stamen" and "style" as they are used today to describe plants.

Turner was not creative in this sense, but persisted with trying to give accurate descriptions using the current English vocabulary at his disposal. He frequently uses "vessell" in the sense of pericarp or container for the seed, often in conjunction with an image to clarify the shape. For example, he writes about the plant Wadde [woad]: "ther hang certayne vesselles much lyke unto lytle tongues wherin the seede is contayned" (Herbal Part 2, fol. 11). This is a fair description of the hanging purple seed-pods of Woad, the famous dye of the ancient Britons. However by "vessell" Turner does not always mean a dry seed case, for in the same part of the herbal, he gives the information that Solanum "hath the fruyte in litle sede vesselles lyke unto bladders round and rede lyke golde, and also smouth lyke a grape of wynberry ..." (Herbal Part 2, fol. 142^{V}). This is an excellent picture of the fruit or berry of this plant whose popular name is Woody Nightshade, except of course that Turner uses "vessell" for the fruit (the golden-red bladders), and <u>his</u> term "fruyte" refers to the seed. He is not unfamiliar with the word "berry" (in the popular rather than the botanical sense) for he says of Juniper

that the "berries are first grene and afterwarde blacke" (ibid., fol. 25).

"Vessell" then, for Turner, meant any case containing seed, but it does not necessarily have to imply a dry fruit. Dry fruits today are particularized as "capsules", "legumes" or "follicles" depending on whether they are formed from one, or more than one, carpel. [The carpel, in turn, consists of the stigma, style and ovary, the female part of the flower.] None of these words was available to Turner, but he does use fairly consistently "codde" to indicate a "legume" or "follicle", both dry fruits which release the seed by splitting. The follicle splits down one seam only, the legume down two seams, but Turner does not differentiate, he uses "codde" to mean either. "Codde" was an Old English word which was used in Saxon leechdoms to mean the husk or outer covering of any fruit or seed, often specifically that of peas and beans, as in "peascod" (O.E.D. "cod", sb^1 2a).

Peas (and beans) belong to the botanical family Leguminosae and it is significant that several of the plants which Turner mentions as bearing "coddes" also belong to this family. He includes Spanish broom (Herbal Part 2, fol. 143^V) and Medica (ibid., fol. 51^V). Describing Medica, Turner acknowledges Dioscorides's lines: "coddes wrythen inward agayn lyke unto hornes wherein is contayned sede of the bygnes of a lentill," but he tries to

clarify the matter further: "there groweth a little thyng to conteyn the sede in which at the first is lyke the end of a wrythen gymlet." On ripening, this "draweth himself together and is made lyke a litle water snayle or a crooked rammes horne...." Obviously Turner considers the shape of this dry fruit to be so contorted that "codde" is either unsatisfactory or insufficient to suggest it. A gimlet was an Old French word for a boring tool (O.E.D. "gimlet", sb^{1}. 1), a kind of wood auger perhaps, and presumably at first the shape of the legume is like the first twist of a screw (i.e. this would match the "hornes" of Dioscorides). Eventually, and Turner is very accurate here, after dehiscence or release of the seeds, the valves often twist up, resulting in a very convoluted shape. He goes on to say that the coddes of the lesser Medica are "rough and pricky" compared with those of the larger plant. A modern guide deals with these descriptions more tersely and without the similes, saying of Spotted Medick: "The pods are short-stalked, rounded, spiny and twisted" and of the hairy kind it describes the pods as "in a flattened spiral with strongly marked lines" (Oxford Book of Wild Flowers, p. 20). From this it would seem as if Turner, in his effort to convey the unusual shape of the pod, omitted some of the fine details (of the stalk, demarcation etc.) which he normally might have noted.

Another plant for which Turner considers that the shape of the fruit might help in identification is Anagyris, which he describes as having "a fruyte in long horned coddes, of the lykenes of a kidney." In this case it is the development of the calyx to surround the fruit which results in a kidney-like appearance. Greater Celandine is a further plant described by Turner as having a codde, in this case "a small codde lyke horned poppy ... but it is ever smaller and smaller from the roote tyll it come at the toppe and in it is conteined a sede greater then popye sede." This is another example of how Turner, though he made no formal attempt at classification, did draw attention to the similarities between parts of plants. Lesser Celandine belongs to the Poppy family and it is thought to have been introduced into England by the herbalists. It is currently described as having a "many-seeded capsule" as a fruit (Oxford Book of Wild Flowers, p. 209), but Turner's description is very accurate and helpful if one knows the horned poppy, presumably a more common plant than the other in his day. The capsule does taper to the base and holds seed larger than poppy seed.

When capsules are round, Turner does not seem to feel it is clear to refer to them as "coddes". For him "codde" always has some resemblance, however faint, to a peascod or pea pod. When neither "vessell" nor "codde" is

satisfactory, he falls back on one of his much used, but vaguer terms, a "knop". This simply means something knob-shaped or round and as such is used by Turner to describe many different plant parts which have a round, knob-like appearance. He describes Kali capsules as being "rounde knoppes wherein are very smal sedes" (Herbal Part 3, p. 37). The looseness of the term in this instance is somewhat mitigated by some firsthand information given at the end of the description, that in East Freseland, he noticed the seeds were eaten by the larks in the Winter.

Turner also uses "knoppe" to refer to the capsule when writing about Flax, and he adds to it an important and accurate observation. After the flowers are gone, "ther come furth round knoppes savyng that ther is in the end a sharp thyng lyke a prick growyng out ..." (Herbal Part 2, fol. 39^{V}). The "prick" in fact is the style which remains behind after the flower has withered. He uses "prick" on other occasions for the persistent style. A good example is in his excellent description of Dog's Tongue: "in whose top, are thre roughe thinges, that cleve unto a mannes clothes joyned al together to a lytle pryk, which is in the myddes, the form of all together is lyke unto a truelove, or a 4-leved clover, wyth a pryke in the myddes" (Herbal Part 1, p. 155). Apart from the slip of "thre" rough things, which was obviously accidental, since Turner later likens

it to a four-leaved clover, this admirably depicts the four nutlets with the persistent style in the centre.

Turner also uses "prick" to mean hirsute, as when he describes Anchusa leaves as "full of pryckes" (Herbal Part 1, p. 31), and he uses it to mean prickles, when he notes that Artichoke loses its "pryckes" with age. However, it is the use of the word "knop" which indicates the difficulties under which he wrote. Not only is it used as a noun to indicate the capsule of certain plants, it is also used in connection with both the flowers and roots of others. For example, he says that Parthenium has "a yellow knop and white flours about it" (ibid., p. 110). Here the "knop" is the central mass of disc florets, which is surrounded by the white ray florets of inflorescence, together forming the full flower head or capitulum.

"Knoppes" serves another purpose in the description of Dodder which "hath floures and knoppes" (Herbal Part 1, p. 94) - presumably indicating the clusters of flowerheads. But in describing Sanicle, he is surely referring to the hooked fruit when he writes that the flowers "departe away and leve behinde them pretye litle knoppes like litle burres" (Herbal Part 3, p. 66). (It is rare for such a term of approbation as "pretty" to escape Turner!) Using the versatility of the word to the full, he describes the large bulbils at the base of the stem in Meadow Saxifrage

as "little knoppes lyke pearles" (ibid., p. 67).

The word is also pressed into service adjectivally. Blewbottel (our modern Cornflower) has "a knoppy head whereupon growe blew floures" (Herbal Part 1, p. 152), indicating the knob-like involucre or rows of bracts below the flower-head. Turner may again mean the involucral bracts when he describes Seaholly as having "knoppy heads which are compassed about with many sharpe and hard prickes after the fashion of a starre" (ibid., p. 177), or he may mean that the whole inflorescence, when viewed from above, has a star-like appearance. Both interpretations could apply.

Sometimes Turner is reduced to a word even less specific than "knop" - the word "thing", usually qualified with a simile. For example, he notes that Ceterache, the fern, has on the inner side of the leaf "small thynges lyke bran, or yelowe scales". He is obviously referring to the sori, clusters of sporangia, though it is not clear whether he understood their function for he continues, "it hath nether flowre, nor seede" (Herbal Part 1, p. 55). It has been shown in Chapter II, that by the time he wrote the second part of his herbal, Turner was convinced that ferns did bear seed. Turner finds himself again lacking precise vocabulary when describing capers. Presumably referring to the fruit, he says it has a "thing ... lyke a long acorne, which whan it openeth, hath cornes lyke unto the cornes

of pomgranates, lytle and red" (ibid., p. 90). Corn was an Old English word for seed, usually a grain, and is used in this sense here. Turner also uses "thing" to mean the style when he writes that from the blue flowers of Commyn "cummeth furth ... a longe whyte thynge lyke a lytle horne" (ibid., p. 150). ("Prick" which he has used on some previous occasions for the style would not be satisfactory here because this style is curved and supple.) For lack of the term "root nodule" Turner writes that Astragalus has "certayne thynges" growing "unto the roote, stronge as horne and blacke" (ibid., p. 56).

A word which Turner uses wrongly, according to modern terminology, but nonetheless sufficiently clearly and consistently for his meaning to be understood, is "sinew". "Sinew" indicates a fibrous cord joining muscle to bone, but when considering plants, Turner usually uses the word to indicate a vein. The function of veins as blood-carriers in mammals was known in the sixteenth century, but Harvey did not discover the circulation of the blood until 1628. However, plant veins as sap-vessels have been used in literature as far back as Chaucer, who in Prologue 3 wrote: "Whan that Aprille ... hath ... bathud every veyne in swich licour, Of which vertue engendred is the flour" (O.E.D. "vein" sb. 3a). Bartholomoeus Anglicus who evidently understood something of the movement of sap through the

veins used the term anatomically, for Trevisa translates him as writing that trees "have weyes and veynes in the whiche kinde moisture is ikepte and passeth therby from the erthe into alle the parties abowte" (O.E.D. "vein" 3a). The modern botanical use of "vein" is morphological, indicating "a slender bundle of fibrovascular tissue forming an extension of the petiole in the parenchyma of a leaf" (O.E.D. "vein" 3b). The word was not used botanically until the sixteenth century, but today as in the early days the sense can be much less specific, often referring to branches from the midrib of a leaf.

Turner tends to use "sinews" where he might have used "veins", as when he describes Greater Rocket having "blake lynes lyke synewes" (Herbal Part 1, p. 173) in the flowers, meaning the coloured veins in the petals. His "synowe that goeth thorow the myd lefe" (ibid., p. 7) in Brank ursine is probably the mid-vein, and the "small sinewes like smalle heres" (Herbal Part 3, p. 69) which prevent Scabious leaves breaking cleanly, would seem to be veins with fibre bundles. However, the use of the word in other descriptions is not always clear. For example, Turner writes that Cole "hath a great brode lefe, and thyke, wyth certayne swellinges, not equall syth the synewes: whyche are as manifest in cole, as in any other herbe" (Herbal Part 1, p. 73). If Turner means that the "swellings" are in the leaf itself, then he may be referring to the

wrinkled appearance which is typical of this plant. If he means that the swellings are within the sinews, that would indicate a knobbiness in the veins, which is also possible. It is not so much the use of the word "sinew" which is unclear here as that the total leaf description is vague, partly due to Turner's phrasing and punctuation. He uses "sinews" rather differently, but with a clear indication of bundles of phloem fibres, when he writes that the Cornell tree has a "barke full of synewes" (Herbal Part 1, p. 134).

The fact that Turner uses "sinew" without qualification or image presumably meant he had confidence that it was the correct word for the situation and would be understood and the right feature identified. Another word he uses with almost as much confidence is "twig", a Northern Old English word which had been used from before the time of the Norman Conquest. In Turner's writings it indicates any very slender stem or branch, though not necessarily "the slender shoot issuing from a branch or stem" which is its modern meaning (O.E.D. "twig", sb^1 1.).

For example, in describing Woodbynde, The grete herball emphasises the movement of this plant, that attribute most apparent to the layman, saying that it "rampeth on hedges" ($Q6^v$); but Turner seems less concerned with the movement than with how that movement is achieved. He says Bindweed has "small twigges wherewyth

it claspeth aboute what so ever stronge thynge it doth tuche" (Herbal Part 1, p. 132), indicating the thin stems of the plant which twine around the stems of other plants as it grows. "Twig" today suggests stiffness as well as slenderness, but obviously Turner's stem was exactly the opposite of stiff. In all his uses of "twig" he seems to be concerned with a fine round slim stem, which may be flexible or otherwise. He says that Agrimony has "young twigges or wandes" (ibid., p. 181) growing out of the root and these would certainly not be brittle in the modern sense of a twig snapping, because they are the stems or "whips" (in modern terminology) which grow out from the stout underground rhizome. He writes of Clinopodium that it is "a lytle bushe full of twygges" (Herbal Part 1, p. 122), presumably meaning a clump of fine stems, maybe the persistence of stems from a previous year. The fineness or thin quality which Turner wishes to impart is emphasised in his description of Garlick leaves as "commyng furth lyke grene twigges" (ibid., p. 14) which is very apt. He does not confuse them with twigs, since he is obviously confident in his knowledge of the various parts of this plant. But he is less sure and into some difficulties when describing Lichen which he describes as having "a certayn litle twig lyke as it were a stalke in the toppe where of are litle thynges lyke sterres" (Herbal Part 2, fol. 36). Obviously

Turner feels this is somewhat inadequate, for he adds a comment on the appearance of the plant as a whole, which he only does rarely: "At the first syght the hole herbe loketh lyke unto a lefe of the crympled lettuce." This total look is very helpful, because the lichen is so small that it is the overall appearance of lichen growth on a rock or wall which catches the eye. Then on closer perusal one can discern the "twigs" topped with "sterres".

A word which Turner uses with more confidence and which, according to the Oxford English Dictionary, he may have been responsible for introducing into botanical terminology, is "whorl". A whorl was "a small flywheel fixed on the spindle of a spinning-wheel to maintain or regulate the speed" (O.E.D. "whorl", sb. 1). Turner obviously has this in mind when he writes of Horehound flowers that they "are lyke whorles in compassyng about the stalck as a whorle goeth rounde about a spyndel" (Herbal Part 2, fol. 51). In the first part of his herbal he writes of Ballote that the "white floures do compasse the stalke about after the maner of whorles" (p. 61). The word has survived in botany in exactly this sense, to mean "A set of members, as leaves, flowers or parts of the flower, springing from the stem or axis at the same level and encircling it" (O.E.D. "whorl", sb. 2). The Systematic Guide to Flowering Plants describes Herb Paris as a

"Perennial herb up to 1 1/2' high. Leaves reverse-egg-shaped, pointed, up to 4 1/2" long, usually in a single whorl of 4 at top of erect unbranched stem. Flower stalked, solitary, arising from centre of whorl of leaves" (Systematic Guide to Flowering Plants, p. 246).

It is significant that Turner in many cases strengthens his written description by naming the exact place where the reader might find the plant for himself. Verification by search and observation is obviously, for him, the very best way to learn about plants. So he tells of beech trees, "Two of the greatest that ever I sawe growe in Morpeth on 11 hylles right over the Castle" (Names, D 1^{v}) and one feels he would feel satisfied if one saw them for oneself.

It probably would not have concerned him that literary giants such as Spenser, Shakespeare and Jonson were more inspired by Lyte and Gerard than they were by him. Arber thinks that Spenser's April eclogue in his Shepheardes Calender (1611) was influenced by Lyte's herbal since it followed that publication by only a year (Arber, p. 126-7). The eclogue praises Queen Elizabeth and includes a stanza filled with flowers:

Bring hether the Pincke and purple Cullambine,
With Gelliflowres:
Bring Coronations, and Sops in wine,
worne of Paramoures.
Strowe me the ground with Daffadowndillies,
And Cowslips, and Kingcups, and loved Lillies:
The pretie Pawnce,
And the Chevisaunce
Shall match with the fayre flowre Delice.[32]

Almost all these flowers are mentioned at the beginning of the second book of Lyte's herbal, together with illustrations of Gillofers, Carnations and Soppes-in-Wine. Since Spenser's listing names in this way is not found in any of his other writings and since Lady Mary Herbert, to whom Spenser addressed poems, lived near Henry Lyte, the supposition seems likely to Arber. However, such lists of flowers were very common in Elizabethan poetry.

Similarly Grigson feels that Shakespeare must have been acquainted with Gerard's Herbal, and that the phrase "azured hare-bell" in Cymbeline (IV. 2-222) may have come from Gerard's description of Hyacinthus Anglicus (Grigson, p. 439) which he called Blew English Hare-bels "loden with many hollow blew Floures" (Gerard, p. 112). Turner is more concerned with imparting an interesting Northumberland custom, that boys "scrape the roote of the herbe and glew theyr arrowes and bokes wyth that slyme that they scrape of" (Herbal Part 2, fol. 18). Lyte, however, has a description for the Autumn Belfloure which contains "blew" and

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[32]Ernest de Selincourt, ed., Spenser's Minor Poems (Oxford: Clarendon Press, 1910), p. 41.

"azured": "of a blew colour, so cleare and excellent, that they seeme to passe the azured skies" (Lyte, p. 172).

It is Gerard, not Turner, who gives "that discourse touching the Poets Hyacinth" under his section on Red Lillies: "There is a Lilly which Ovid. Metamorph. lib. 10. calls Hyacinthus, of the boy Hyacinthus, of whose bloud he feigned that this floure sprang, when hee perished as he was playing with Apollo: for whose sake he saith that Apollo did print certain letters and notes of his mourning" (Gerard, pp. 193-4). The letters inscribed on the leaf are supposedly "Al, Al," meaning " Woe, Woe!" Milton makes reference to this flower in "Lycidas" -

> Next Camus, reverend sire, went footing slow,
> His mantle hairy, and his bonnet sedge,
> Inwrought with figures dim, and on the edge
> Like to that sanguine flower inscribed with woe.
> (ll. 103-106)

but there is no proof that he got the idea from Gerard. A man of Milton's learning would more likely have found it in the original Latin.

One feels that Turner might have had little interest in the way Shakespeare and Webster make skilful use of the traditional virtues of herbs in their scenes showing mental derangement. Ophelia in Hamlet (IV. 5. 174-185) and Cornelia in The White Devil (V. 4. 70-84) both offer rosemary, rue and pansies or heart's-ease. The old "virtues" of herbs were still good value in literature a century after the Skelton lyrics. Webster's The White Devil

is thickly studded with the folklore of herbs. There are at least three references to the mandrake, including Vittoria's injunction to Flamineo:

> I prithee, yet remember
> Millions are now in graves, which at last day
> Like mandrakes shall rise shrieking.
> (V. 6. 63-65)

Yet fifty years earlier the mandrake folklore had received short shrift from Turner and he was particularly outspoken against those who capitalised on it financially, by trimming the roots to look like human figures and selling them "to mocke the poore people with all, and to rob them both of theyr wit and theyr money." He continues "I have in my tyme ... taken up the rootes of Mandrag out of the grounde, but I never saw any such thyng upon or in them, as are in and upon the pedlers rootes that are comenly to be solde in boxes" (Herbal Part 2, fol. 46). He goes on to recommend the broth as an anaesthetic.

With regard to popular names for flowers and their parts, poets seem to be attracted to those suggested by Gerard. In "The Sad Shepherd" (1641) Ben Jonson writes:

> Her treading would not bend a blade of grass,
> Or shake the downy blow-ball from his stalk!

The "downy blow-ball" refers to the dandelion and specifically to the seedhead, as Gerard explains in his herbal: "... upon every stalk standeth a floure greater than that of Succorie, but double, & thicke set together,

of colour yellow, and sweet in smell, which is turned into a round downie blowball, that is carried away with the wind" (p. 290). Turner gives "priestes crowne" (Names, $D6^{V}$), an old name going back to the middle ages, but obviously "downy blowball" is far more useful in suggesting the lightness of the girl's tread that does not even disturb the delicately attached down. Gerard also uses "downy Blowball" for the seedhead of Goats Beard (p. 735).

Grigson thinks that Gerard was also the source of "Ladysmocks all silver-white" in the song from Love's Labour's Lost (V. 2. 903), arguing that both Shakespeare and Gerard "call the flowers white, when they are more usually lilac" (Grigson, pp. 74-75). In fact Gerard gives the name as "Milke white Lady-smocke" but goes on to write: "The floures grow at the top, made of foure leaves of a yellowish colour." Thomas Johnson, in expanding and correcting Gerard's herbal for the edition of 1633, adds: "the floures are milke white, as our Author truly in the title of his figure made them; yet forgetting himselfe in his description, he maketh them yellowish, contrarie to himselfe and the truth" (Gerard, p. 258). This would not seem to make Grigson's argument very conclusive.

Lyte has a lovely description of the Calendula, or golden marigold (as distinct from the marsh marigold), which he writes of as having: "pleasant, bright and shining

yellow floures, the which do close at the setting downe of the sunne, and do spread and open againe at the sunne rising" (Lyte, p. 163). Grindon and Beisly, amongst others, have both commented on Shakespeare's allusion to this flower in Sonnet XXV:

> Great princes' favourites their fair leaves spread
> But as the marigolds at the sun's eye.

George Wither has a poem "The Marigold" (1635) which also suggests the display of the marigold as having a fawning quality - "the grateful and obsequious marigold":

> When, with a serious musing, I behold
> The gratefull, and obsequious Marigold,
> How duely, ev'ry morning, she displayes
> Her open brest, when Titan spreads his Rayes;
> How she observes him in his daily walke,
> Still bending towards him, her tender stalke;
> How, when he downe declines, she droopes and mournes,
> Bedew'd (as 'twere) with teares, till he returnes;[33]

The sixth line here is especially suggestive of Lyte. It is very reminiscent of his descriptions such as that of Sowbread flowers, mentioned earlier in this chapter, which "hang upon tender stalks, nodding or beckning downewardes ..." (Lyte, p. 330). Such poetic phrases obviously lend themselves to poetry far more than Turner's prosaic lines.

One of the rare examples of literature borrowing from Turner might be in the matter of sea-holly or eringoes being used as an aphrodisiac. Turner reports that: "The later wryters use the roote of thys herbe, to stirre up the

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[33]George Wither, A Collection of Emblemes 1635, ed. John Horden (Menston: Scolar Press, 1968).

luste of the body, and they use to gyve it bothe to men and wymen that are desyres to have chylder.... Sume in our dayes condite or kepe in sugar the rootes of sea hulner for the same purpose" (Herbal Part 1, p. 178). But Gerard also writes that "The roots condited or preserved with sugar, as hereafter followeth, are exceeding good to be given unto old and aged people that are consumed and withered with age and which want naturall moisture" (p. 1163). Shakespeare referred to such eringoes in The Merry Wives of Windsor: "Falstaff: My doe with the black scut! Let the sky rain potatoes; let it thunder to the tune of 'Green Sleeves,' hail kissing comfits and snow eringoes" (V. 5 21-23). As Beisly points out (p. 27), John Marston also refers to their powers in The Fawne: "And yet I hear, Sir Amoroso, you cherish your loins with high art, the only ingrosser of eringoes prepar'd cantharides...." (II. 1. 37-38). One feels that Turner passes on the information about eringoes simply as part of the total knowledge of a plant. By the revised version of Part 1 he is far more concerned with distinguishing between the opinions of the different classical writers and he barely mentions the aphrodisiacal use.

Turner's over-riding aim is to describe plants as fully and accurately as he can, using the language understood by the common Englishman of his day, including the Englishman of the north with whom he felt such kinship. His direct approach to plant identification often precludes the charm of the Lyte and Gerard herbals, but the attentive reader of Turner's perceptive details realises afresh that here is a forerunner of the true botanist.

CHAPTER IV

TURNER IN THE SCIENTIFIC CONTEXT

This final chapter will consider the extent to which Turner possessed that spirit of "modern" scientific enquiry which a hundred years after his death was sweeping England and prompted the formation of the Royal Society for the Promotion of Natural Knowledge. Although the Royal Society was founded in 1662, men calling themselves "the invisible college" had been meeting for scientific discussion and experiment in London and Oxford for twenty years before that. It is significant that by 1659 they were meeting at Gresham College,[1] which had been established in 1596 with seven professors (one each for Astronomy, Geometry, Physics, Law, Divinity, Rhetoric and Music) who were to lecture in English. It was an institution which partially met the requirements of the academy which had been proposed by Sir Humphrey Gilbert early in Queen Elizabeth's reign. He hoped that such an academy would encourage learning in English and that its professors would emphasise the practical

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[1] Edward Neville da Costa Andrade, A brief history of the Royal Society (London: Royal Society, 1960), p. 3.

applications of their disciplines (Stimson, p. 9). Gresham College realised some of these hopes and interestingly enough, Turner's grandson, Peter Turner, later became a Professor of Geometry at the College (Facsimiles, p. 26).

Lecturing in English, however, was still very controversial. Even Abraham Cowley, in his Proposition for the Advancement of Experimental Philosophy (1661), although advocating that the "sixteen professors" resident in his proposed College should be "bound to study and teach all sorts of Natural, Experimental Philosophy"[2] and that the "popular and received Errours" of such should be demonstrated by trial and "taken notice of in the publick Lectures" (ibid., p. 38), does not suggest that the public lectures should be in English. On the contrary, he states that the proposed College should "give an account in Print, in proper and ancient Latine, of the fruits of their triennial Industry" (ibid., p. 39).

The Royal Society was anxious to promote the "new philosophy", the idea that systematic observation and experiment were the most reliable way of investigating natural phenomena. The members, and particularly the non-university representative of the original group, Robert Boyle, were following the tenets of Francis Bacon who in his

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[2]Abraham Cowley, The Advancement of Experimental Philosophy (1661; facsimile rpt. Menston: Scolar Press, 1969), p. 31.

Novum Organum (1620) had argued that deductive reasoning was not as effective as inductive reasoning for the discovery of new knowledge. To reason inductively one must gather facts from wide observation and experiment, then consider the similarities and dissimilarities amongst the facts. Hypotheses may be formed from the resulting evidence which put the facts into a theoretical framework. A good hypothesis should suggest further experiments which will test its validity.

Turner, of course, had not gone as far as this. However, whilst he did not formulate new hypotheses, it has been shown in the previous chapters that he did use his own observation and experimentation to test the statements of both ancient and contemporary botanical writers. Even when writers were his friends and teachers he did not hesitate to correct them if his experience suggested they were wrong. For example, he writes in the second part of his herbal:

> Antonius Musa som tyme my master in Ferraria, and Leonardus Fuchsius my good frende in Germany hold that Feverfew is not Parthenium... But though they ar both my frendes, yet I will hold with the truthe rather than with them, when as I judge they hold not with it (fol. 78^{V}) (Quoted in English Naturalists, p. 82).

Such testing, or what Raven describes as the accurate study of past records linked with first hand knowledge of the data, is a first and indispensable step in any new synthesis (ibid., p. 10).

In 1663, a second charter granted the Royal Society a coat of arms with the motto "Nullius in Verba" or "On the word of no man". This is taken from the lines of Horace:

> Ac ne forte roges, quo me duce, quo lare tuter,
> Nullius addictus iurare in verba magistri.
>
> ('And do not ask, by chance, what leader I follow or what godhead guards me. I am not bound to revere the word of any particular master'.
> Quoted by Andrade, p. 4)

Such a motto indicated the resolution of its members to be bound by no authorities other than the authority of experiment. However, this did not mean abandoning the authorities as much as challenging them. Richard Toellner in his essay "The Controversy between Descartes and Harvey Regarding the Nature of Cardiac Motions" links Harvey, Bacon and Galileo as largely responsible for the introduction of the empirical and inductive method which started modern scientific research.[3] Harvey discovered the circulation of the blood by the inductive method and asserted that "no dogmas can suppress the obvious facts and no old traditions stifle the work of nature because nothing is more ancient and of greater authority than nature itself" (ibid., p. 75). Harvey had preference for the "sensus" (perception) and "autopsia" (personal observation) as contrasted with "ratiocinium" (the fruits of reason, ibid., p. 76). He established through experimentation that blood circulated

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[3]Allen G. Debus, ed., Science, Medicine and Society in the Renaissance. Essays to honor Walter Pagel (New York: Science History Publications, 1972), II, 75.

through the body, instead of moving separately back and forth in the arteries and veins as Aristotle and Galen had believed. Even so he stayed within that Aristotelian framework of thought which granted circular motion a special place, whilst at the same time his own precise observations and experimentation were leading him to more accurate conclusions. When the Parisian anatomist Riolan questioned Harvey's results, Harvey backed his personal observation against traditional knowledge (ibid., p. 85).

This, too, is a stage which Turner reached. The Official Record of the Royal Society stated that its motto was "an expression of their determination to withstand the domination of authority and to verify all statements by an appeal to facts" (Stimson, p. 64). Whilst Turner was not so aggressively inclined towards authority as this - indeed, he had the greatest respect for Dioscorides and Theophrastus in particular - nonetheless he did attempt to "verify all statements" by first-hand checking and it has been shown that he was not afraid to contradict authority when his own investigations gave different results.

Although observation and experiment became the authority for the members of the Royal Society, they did not reject religion. Bacon saw the investigation of Nature as divine work. He felt that God had left "seals and imprints" also "footprints and vestiges" as revelations of

His providence, if men cared to study them (Debus, p. 107). Similarly it was written into the charter of the Royal Society that the present and future members were to apply their studies "to further promoting by the authority of experiments the sciences of natural things and of useful arts, to the glory of God the Creator, and the advantage of the human race" (quoted by Stimson, p. 6). Turner, too, saw all his work in exactly this context. For him the "knowledge of Herbes" was "amongest the syngular giftes of God" (Herbal, Part 1, A2). God "indued man with knowledge, that he might get prayse of his wonders" (ibid.), and Turner passes on his God-given knowledge (or God-inspired knowledge) to benefit his fellowmen "for the love that I beare unto my countre" (ibid. A3).

Turner was aware too, before it was promulgated by Bacon, that the cause of science is furthered by co-operation between men of like minds. Another tenet of the Royal Society was the international co-operation of learned men without the boundaries of race or creed (Andrade, p. 28). This was achieved so well that one of the Society's critics, Dr. Henry Stubbs, considered it "dangerous to religion" that "Protestants and Papists could converse together in friendly discourse" (Stimson, p. 87). A hundred years later even war - the American War of Independence, begun in 1775 - failed to affect the spirit of co-operation which existed

between Benjamin Franklin (elected a Fellow in 1756) and the Society, though Franklin was a leader of the revolutionaries. He directed American cruisers not to interfere with James Cook when the explorer was voyaging near North America.

It was exactly this type of international co-operation which was an important contributing factor to Turner's herbal. All three parts, but especially the second part, not only have references to the works of continental botanists (as discussed in Chapter I) but refer also to many meetings with them at which Turner handled and discussed specific plants. In his description of Lotus urbana, he writes of a certain herb shown to him by "the learned men of Ferraria" and considers how it differs from English wood sorrel (Herbal, Part 2, fol. 41^{v}). Maybe one of these "learned men" was Antonio Musa Brasavola, under whom Turner studied in Ferraria and to whom he refers in the second part of his herbal (fol. 67). Lucus Gynus is given the credit for showing Turner Hyacinthus (Herbal, Part 2, fol. 18), and after his interesting remarks on Trifolium - "in everye furth buddinge thre. The smell of them when they come fyrste furth, is lyke unto rue, but when as they are full growen, they smell of earth piche...." - Turner writes that he first saw it "in Doctor Gesnerus garden" in Zurich (Herbal, Part 2, fol. 158). Turner's visits to botanists of such repute resulted in benefits to both visitor and

visited. As F.D. and J.F.M. Hoeniger point out in their booklet The Growth of Natural History in Stuart England from Gerard to the Royal Society, Turner "generously exchanged information on plants, fishes and other animals with several European biologists, particularly with Konrad Gesner, who frequently refers to him in his encyclopedic work on animals.[4] Two hundred years earlier Pulteney remarked that Turner sent natural curiosities from England to Gesner's museum (Pulteney, p. 65). Gesner himself speaks of Turner sending him onion bulbs (English Naturalists, p. 83). An extant letter from Turner to Gesner on fishes (in Latin) refers several times to local names for fish and other sea creatures.[5] For example, "The animal of the seal family found in the North, where I uttered my first infant cries, the Northumbrians call a "porpoise" (Raven's translation, English Naturalists, p. 51, of "Letter", p 1). Two further references may be translated as follows: "This species of goby, unless I'm mistaken, is a small coastal fish which the Northumbrians, Cumbrians and Scots call a

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[4] F.D. Hoeniger and J.F.M. Hoeniger, The Growth of Natural History in Stuart England from Gerard to the Royal Society (Charlottesville: University Press of Virginia, 1969), p. 4.

[5] "Letter" to Conrad Gesner, appended to Book IV of Historia Animalium (Francfort: 1620), 4 unpaginated pages.

"gardeli" ("Letter", pp. 2-3) and "Another kind of trout, found in the North, we call a bulltrout. It is called this from its great size in which it exceeds all other trout" ("Letter", p. 3).

Brasavola, Ghini and Gesner were all professors of botany of some repute. They respected the classical botanists whilst at the same time recognizing their limitations, so that they were able to use them as springboards for their own practical endeavours. One learns from Arber's Herbals that Ghini initiated herbarium making or collections of dried plants and in the middle of the sixteenth century, possessed "some three hundred pressed specimens" in addition to those he sent to other botanists. It is on record that he sent "dried plants gummed upon paper to Mattioli in 1551" (Arber, p. 139). Arber says that Turner also made a herbarium; perhaps this is a reference to it in the description of Spikenard in his herbal:

> I found in the shop of Jacob Diter the Apothecari of Wiseburg on pece of nardus whiche hath a stalk a fynger long and of the bygnes of a metely big straw, which I have to shew at thys present daye (Herbal, Part 2, fol. 63).

A hundred years later a member of the Royal Society, John Evelyn, also possessed a herbarium: Samuel Pepys records in his diary for November 5th, 1665, that he visited Evelyn and was shown in addition to "the whole secret of mezzo-tinto", "his 'Hortus Hyemalis'; leaves laid up in a book of

several plants kept dry, which preserve colour, however, and look very finely, better than an Herbal."[6] Raven says that "dry gardens" from Padua (that is, collections of dried plants), were issued and circulated in English universities from the beginning of the seventeenth century (English Naturalists, p. 352).

Turner's description of Spikenard indicates another aspect of learning as practised by the Royal Society - the exchange of views and ideas not only amongst University professors, but embracing all curious and interested minds. This learning from everyday, non-bookish experience had been gaining ground since the turn of the century. When William Gilbert published his book on the magnet's properties as they could be verified by experiment, he gave as the source of his inspiration the "foundrymen, miners, and navigators with whom he had personal contacts."[7] The three parts of the herbal give many glimpses of Turner poring over plants in apothecaries' shops, in private gardens and monastery grounds, discussing the objects of his scrutiny with the owners. He says he never saw true Organ in England "savyng in master Ryches garden in London where as I saw many other

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[6]John Warrington, ed., The Diary of Samuel Pepys, 2nd rev. ed. (London: Dent, 1953), Vol. II, p. 188.

[7]Quoted in the introduction to The Book of Secrets of Albertus Magnus, p. xxix.

good and strange herbes which I never saw any where elles in all England" (Herbal, Part 2, fol. 69 (misnumbered 96)). He also saw one kind of Stachis growing in the same garden (ibid., fol 146-146^{V}) and Triacle Mustard "groweth in maister Riches gardin and maister Morgaines also, and in maister Hambridges gardin in Summersedshyre as I remembre" (ibid., fol. 152^{V}). There were exchanges of plants over the years, for in the third part of the herbal Turner writes of Riche and Morgan growing Gratiola from roots he has given them (p. 33). Hugh Morgan was the recipient of plants from many places. Stearn says he was "described" by Gerard in 1597 as 'a curious conserver of rare simples'" (quoted in Facsimiles, p. 8) and suggests he was responsible for the introduction of many plants into England. Turner says of Mistletoe: "I never sawe more plentye of righte oke miscel [mistletoe] then Hugh Morgan shewed me in London. It was sente to hym oute of Essex" (Herbal, Part 2, fol. 165).

Turner also mentions "maister Bogges" who has many Linden trees growing in his park "within two mile from Colichester" (ibid., fol. 153^{V}), and "Master doctor Wendy, the kyngs Phisycyane" who examined Mugwurt with him (Herbal, Part 1, p. 49). He evidently also examined plants with Peter Condenburg "a faythfull and learned apothecari" in Antwerp. Here he saw that kind of Organ called Onitus

(like English hyssop, he explains). Presumably Condenburg had a herbarium for Turner saw it "dry", with "sede lyke berries joyned together" (Herbal, Part 2, fol. 69). He also saw Vitex "growyng at the black freres in Ferraria and afterward in Peter Cowdenberges gardin in Anwerp" (Herbal, Part 2, fol. 165^{v}). It is evident that not all his collaborators were "book-learned" for in his discussion of berefoote for example, he writes "by the comunication that I had wyth a certayne wyse Germane, yet unlearned in the latin tonge, and by more diligent examyninge of the herbe wyth the description of Dioscordes, I perceyved that nether of bothe those kyndes of berefoote was helleborus niger, but consilago" (Herbal, Part 1, p. 129). It is significant too, that his friends included other travellers, and that their travelling often adds to Turner's knowledge. In this way he is able to offer the information about candied Angelica: "The rootes are now condited [preserved] in Danske, for a frende of myne in London, called maister Alene a marchant man, who hath ventered over to Danske, sent me a litle vessel of these, well condited with very excellent good hony" (Herbal, Part 3, p. 5).

There seems to be no doubt that Turner's move to London for most of the last ten years of his life, apart from three years as Dean of Wells between 1561 and 1564, brought him into contact with many minds like his own, including,

as Raven says "an interesting group of pharmacists, students of herbs and owners of herb-gardens" (English Naturalists, p. 116). The common link was a practical knowledge of plants, a knowledge which grew through first-hand experimentation and observation and exchange of ideas. Perhaps the accumulation of facts was not as systematic as Francis Bacon would have wished, mainly because many of the plant growers still did not write anything down, as Turner had complained in the 'Prologe' to his herbal. Co-operation, though practical, was informal and it was the formalising which the Royal Society hoped to achieve through bringing men of like minds together at set times, for the purposes of demonstration and discussion.

The informal demonstrations continued throughout the seventeenth century, probably on a similar basis to the way in which Turner had visited his apothecary and herbalist friends. Members visited each other's homes and saw collections, curiosities and experiments. Samuel Pepys frequently visited John Evelyn and the novelties he saw there are recorded in his Diary. For example, on May 5th, 1665, he writes: "To Deptford, and after dinner to Mr. Evelyn's; he being abroad, we walked in his garden, and a lovely noble ground he hath indeed. And, among other rarities, a hive of bees, so as, being hived in glass, you may see the bees making their honey and combs mighty pleasantly (Diary

2, p. 112-113). Evelyn, in turn, in his diary, recounts a visit to Dr. John Wilkins (a founding Fellow of the Royal Society and one of its first secretaries) which explains, amongst other things, the history of the transparent beehive.

> We all din'd at that most obliging and universally-curious Dr. Wilkins's, at Wadham College. He was the first who shew'd me the transparent apiaries, which he had built like castles and palaces, and so order'd them one upon another as to take the hony without destroying the bees.... and he was so abundantly civil, finding me pleas'd with them, to present me with one of the hives which he had empty, and which I afterwards had in my garden at Sayes Court.... He had, above in his lodgings and gallery variety of shadows, dyals, perspectives, and many other artificial, mathematical, and magical curiosities, a way-wiser [compass, odometer or roadmeasurer], a thermometer, a monstrous magnet, conic and other sections, a balance on a demi-circle, most of them his owne....[8]

As well as being shown informally to members, collections of various kinds were exhibited at the formal meetings of the Royal Society, together with demonstrations of experiments. For example, Stimson gives an account of a special meeting of the Society in July, 1663 when the King, Charles II, was present. Demonstrations were given by Robert Hooke, Boyle's most outstanding disciple, and others.

> Mr. Hooke and the operator (or technician) were to take care that the compressing engine would not fail that day. Various Fellows were to have on display their personal collections of rarities;

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[8]William Bray, ed., Memoirs Illustrative of The Life and Writings of John Evelyn, Esq., F.R.S. (London: Murray, 1871), p. 231-2.

> Dr. Ent was to prepare a dissection of an oyster or a lobster; Wren was to suggest some experiments and Dr. Wilkins was requested "to undertake the experiment of raising a great weight by a man's breath; and that of a metallic tree, both with mercury, after Dr. Power's way, red and green, and to engage Dr. Power to do magnetic experiments." (Stimson, pp. 78-79)

At this point the Society seemed to be collecting experiments in the same way that its members collected rarities or objects of interest. It was mocked for this in the literature of the time, most specifically in Thomas Shadwell's play "The Virtuoso", produced in 1673. The central character, Sir Nicholas Gimcrack, is a parody of the Society's members' interest in experimentation; his experiments are carried to absurdity, including his attempt to learn swimming by lying on a table and copying the movements of a frog in a bowl of water beside him.

> Sir Nicholas: I impede its motion by the detention of this filum or thread within my teeth which makes a ligature about its loins, and though by many sudden stops I cause the animal sometimes to sink or immerge, yet with indefatigable activity it rises and keeps almost its whole body upon the superficies or surface of this humid element.[9]

The Royal Society's enjoyment of collections was ridiculed again a full century later when Joseph Addison resurrected Shadwell's Sir Nicholas Gimcrack for an article

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[9]Thomas Shadwell, The Virtuoso, eds. M.H. Nicholson and D.S. Rodes (Lincoln: University of Nebraska, 1966), II. 2. 17-23.

in the Tatler, purporting to be that knight's will. Sir Nicholas left his wife one box of butterflies, one drawer of shells, a female skeleton and a dried cockatrice.

> His oldest son was cut off with a single cockle-shell, but his second son he made his sole executor and heir of his "flowers, plants, minerals, shells, pebbles, fossils, beetles, butterflies, caterpillars, grasshoppers and vermin not previously specified," and also all his "monsters, both wet and dry"
>
> (Stimson, pp. 128-129).

Yet it was from this base of seemingly haphazard experimenting and collecting that the Royal Society rose to the eminence it enjoys today, the significance being that collections of actual objects and of facts about phenomena form one of the bases of science, as Bacon well realised. Turner's herbal might well be viewed as an enormous and painstaking collection - a collection of plant names and identifications.

It was no accident that the establishing, stocking and visiting of botanical gardens developed rapidly between Turner's time and the formation of the Royal Society. This was simply an extension of the smaller herb gardens in England and on the continent from which Turner learned so much. Pulteney points out that botanical gardens existed in the ancient world. Attalus, the last king of Pergamus, is said to have collected hellebore, henbane and aconite to make experiments on criminals with counter poisons.

Nevertheless, after the time of the Romans, such large collections of growing plants for study disappeared until the middle of the sixteenth century when they were formed again in Italy at Padua in about 1542-45, at Pisa in 1547 and at Bologna in 1567.[10] Gesner had a vast botanical garden at Zurich which Turner visited. Turner had gardens of his own both in England (at Sion House and Wells) and on the continent (at Cologne and Weissenberg) to which he frequently alludes in his herbal. He writes of having Crowfoot at "my orchard at Wyssenburg" (Herbal, Part 2, fol. 114^{v}).

To what extent Turner's gardens were sufficiently large and well-stocked to deserve the name "botanical" cannot be known, but in Elizabeth I's reign and afterwards gardens for pleasure and study became increasingly important amongst gentlemen, so that leading botanists were often appointed to lucrative positions as official gardeners (Natural History in Tudor England, p. 52). This in fact had been partly Turner's position at Sion House with the Lord Protector. Gerard, too, not only had his own garden but oversaw Lord Burghley's gardens in the Strand and at Theobalds in Hertfordshire. Amateur and professional plant growers alike were eagerly looking for new seeds and plants to try out in their gardens. Hoeniger quotes from a letter in which Robert

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[10] von Sachs, History of Botany 1530-1860, p. 18.

Dudley, Earl of Leicester, writes to Jean Hotman, Sieur de Villiers Saint Paul, asking him to procure seeds for him in Italy "as well for herbs and salads as for all kind of rare flowers beside, seeds for melons, cauliflower and such like as asparagus and all sorts of radish" (ibid.). Botanical experimentation was popular.

In 1622 the Earl of Danby granted Oxford University a site for an official botanical garden. A hundred years later another famous garden belonged to Sir Hans Sloane, a member of the Royal Society for sixty-three years. When he died in 1753, he left his gardens to the Society of Apothecaries. He was a "collector extra-ordinaire", not only of plants, and left collections to the nation which included "40,000 books and some 3500 manuscripts as well as nearly 80,000 specimens of all kinds" (Stimson, p. 135).

The Society of Apothecaries had been established by Sloane in the seventeen twenties and the scientific investigation of British flora became a regular part of their activities. They instituted an annual Simpling Day, usually late in June, on which members engaged in a systematic search for plants. This was by no means new, for in the preface to his revision of Gerard's Herbal Thomas Johnson writes of his "loving friends and fellow Travellers in this study [botany] whose companie I have formerly enjoyed in searching over a great part of Kent, and who are

still ready to do the like in other places..." (Gerard, Herbal ¶¶¶ 2^{v}). This was on July 13th, 1629, for Thomas Johnson later wrote up the plants they found in Kentish Journey, giving an itinerary and list of plants he and his friends found during these days in July and on a further one-day excursion to Hampstead Heath in August. Hoeniger points out that "As the very first compilation of local flora in Britain, this small volume is an important landmark in the history of English botany" (Natural History in Stuart England, p. 20). Later, systematic botanising excursions were made into south and south-west England and north Wales and the catalogue of resulting plants published as a preliminary to a proposed complete British Flora, but unfortunately Johnson died in 1644 during the Civil War.

Although Johnson and his fellow botanists were medical men, it is evident from their records that they were dealing with plants as botanists and not collecting them primarily as herbs for medical use. What Turner had done alone by visiting certain regions on successive years, or by observing plants at different stages of their life cycles, was now being done collectively, in a systematic way, so that the accumulation of accurate facts about the British flora accelerated rapidly.

However, the fact-collecting continued to be very largely a study of plant form and identification for another

century and a half. This is very interesting because it is tempting to feel that a man of Turner's intelligence might have moved on beyond gross morphology towards establishing relationships between the outer forms of plants and their inner organisation. Apart from breaking open plant parts (such as leaves, roots, stem, seeds) to learn more about texture, colour and smell, he seems to have been little interested in phytotomy, or plant dissection. He gives few descriptions of the functions of various parts (i.e. vegetable physiology) except where they are a natural corollary to his understanding of individual plant forms. All Turner's efforts seem to be centred on correct identification and medical benefit. Julius von Sachs is particularly damning about the botanists of this period. He says:

> ... neither in Germany, nor Italy, neither in France nor England, did the botanists produce anything of importance. The representatives of the science did not count among the more highly gifted or among the thinkers of their time; and so content with the minor work of collecting and cataloguing plants, and with endeavouring to know all plants as far as possible by name, they lost whatever capacity they may have possessed for more difficult operations of the mind simply by not attempting them
>
> (History of Botany, pp. 40-41).

Maybe Turner could not see any practical benefit from such mental exercise. All Turner's writings reveal him as practical rather than theoretical and sincerely concerned with using his knowledge for the public good. His introduction

of Lucerne as an English fodder crop is a good example of his social conscience:

> Now it that I have proved my selfe, I will not refuse to shew unto you, my countremen. I have sowen iii kyndes of medic fother, the leste kynde, the grete smoth kynde, and the great rough kynde. The lest kind do I alow leste of all other, because the leves and stalkes are al very litle, and therfore in fedyng of cattel can do but litle service. The grete smoth kynde as I have proved, groweth into a mervelous greate bushe. As for the greate roughe kynde, how greate it will be, I have not as yet proved, for I never sowed it before thys summer. But by all tokens that I can se as yet, it is lyke to be as good and greate as the greate smoth kynde. If we have but a bushe or ii of Medic, and would fayne have much sede rype before the commyng of wynter, ... it is best to take the moste parte of every bushe at the joynt of the herbe ... and then ye must set the braunches that ye have plucked of, depe in the grounde, and water them twyse on the day, and they shall bryng furth sede as well as them that are sowen, and muche better then they that are overshaddowed in the bushe and want the help of the son. Thys have I proved diverse tymes, wherefore I dar be bolde to write it.
>
> Herbal Part 2 , fols. 52-53

Turner was essentially an applied scientist. Yet von Sachs implied that Turner and botanists like him on the continent allowed their intellectual visions to be limited, to be as earth-bound as the plants they sought so diligently to identify.

Yet if it was such "minor work", why did plant listing and identification continue to constitute an important part of botanical research up to and well beyond the inception of the Royal Society? In Gunther's Early British Botanists

and their Gardens there are over a dozen enlightening lists of plants grown in English gardens between Gerard's time and the Royal Society's formation (p. 303). They range from brief references to plants in Hugh Morgan's garden (frequently mentioned by Turner) between 1569 and 1587, to fuller references to those in Edward Morgan's garden in Westminster in the 1660's. Edward Morgan was a Welshman, no relation to Hugh Morgan, and was one of the botanists who accompanied Johnson on his above mentioned excursion into North Wales.

Many of these garden lists and the clues to the whereabouts of others were found amongst the papers of John Goodyer, a fine practical botanist who was so highly regarded by Thomas Johnson that he gives Goodyer's descriptions of elms in preference to those of Gerard, in his revision of Gerard's Herbal. He also gives Goodyer credit for first noticing Gerard's mistake in the placing of a Cress (English Naturalists, p. 278). Goodyer's work is a further illustration of why botanists did not probe deeper than plant morphology and identification. Despite the greatness of Turner's labours, by far the largest proportion of his herbal, the first two parts, is concerned with identifying plants described by classical authors or by his contemporaries on the continent. Only in the third and shortest part does he enter into a study of English flora

independent of the old authors. Goodyer tried to continue where Turner had left off, with descriptions, in English, of specifically English plants. Between the years 1616 and 1621 he made a good beginning, but eventually his field work tapered off and the hope of producing a descriptive flora of England "did not survive the death of his friend Johnson and the upheavals of the Civil War" (English Naturalists, p. 293).

In fact, a movement away from gross morphology did not occur until a full century after Turner's death, and was strongly influenced by the refined technology of the microscope. When Robert Hooke published his Micrographia in English, in 1665, describing several dozen observations - many biological - which he had made with his compound microscope, he included his comments on cells. Although the "microscopical pores" he saw in cork were in fact empty spaces, the "multitude of little oblong transparent bodies" he saw on the surface of leaves in his study of moss, were indeed cells.[11]

This discovery extended the range of detailed plant morphology immensely when utilised by the keen mind of Nehemiah Grew who was elected a Fellow of the Royal Society in 1671, became Secretary in 1677 and the third salaried

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[11]Robert Hooke, Micrographia or Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses with Observations and Inquiries thereupon, ed. R.T. Gunther (1665; facsimile rpt. New York: Dover, 1961), pp. 113, 131.

officer in 1681. One of his tasks was the compilation and publication of the Catalogue and Description of the Natural and Artificial Rarities belonging to the Royal Society and preserved at Gresham College (1681). However, in his work on plant anatomy he was able to move away from gross description and comparison into a study of tissue and function. In these two areas he recognised the stem differences between monocotyledons and dicotyledons and also discovered that flowering plants reproduce sexually.

Nonetheless, it is significant that at this same period when Grew was getting inside plants, an equally able and respected botanist, John Ray, was still absorbed in the systematic description and classification of British plants. Elected a Fellow of the Royal Society in 1667, he published the Catalogus plantarum Angliae or "Catalogue of English Plants" in 1670, based on the field observations of both himself and others (Natural History in Stuart England, p. 38). Genera were still arranged alphabetically, as in Turner's herbal, though the actual identification had improved. Ray wrote almost all his botanical works in Latin and in his Methodus plantarum (1682, emended 1703) classified plants according to "genuinely scientific principles" (Natural History in Stuart England, p. 40) distinguishing between monocotyledons and dicotyledons and making a commendable attempt to divide plants into families. He also

wrote the Historia plantarum, exceeding 2,600 pages in three volumes (Volume I, 1686; Volume II, 1688 and Volume III, 1704) because "no Englishman since Turner had attempted such a task" (Natural History in Stuart England, p. 41). Like Turner he gives details of gross morphology, habit, locality, and use, adding also related species. His excellent descriptions are in Latin and therefore there is little point in comparing them with Turner's, but his work is a natural progression of Turner's own and Ray paid tribute to him as "a man of solid erudition and judgement." Ray probably recognised that his own understanding of natural affinity was a sideline of the practise of describing plants.

Collection, description and identification continued to monopolize Royal Society fellows after Ray. Sir Hans Sloane in the early eighteenth century collected specimens in the West Indies, especially Jamaica, and in Madeira. In the latter half of the same century, another famous botanist, Joseph Banks, who later became President of the Royal Society, took part in Captain Cook's first voyage around the world (a voyage which the Society had instigated) and spent his time collecting and classifying natural history specimens. Banks had gained his skill as a field naturalist on an earlier voyage to Newfoundland and Labrador. In sending back the first properly documented collections from that part of North America, Banks was following Bacon's injunction

that science must dismiss all old theories and compile new "histories of nature" or factual encyclopedias. Only from such cumulative collections of facts could common characteristics be learned and new theories devised.

In botany the facts to be acquired were so numerous that the patient labour involved might seem to be indicative of only second-rate scientific minds unless one considers the accomplishment in relation to others of the era. A remark such as that of Pulteney that in Turner's time "almost all small plants were disregarded and Cryptogamia [i.e. plants having no stamens or pistils, therefore no proper flowers] almost overlooked, except by him" (Pulteney, p. 69) puts the facts in perspective. Julius von Sachs in his History of Botany says that the chief hindrance to more rapid advance in botany has been that the majority of writers simply collected facts, or if they attempted to apply them to theoretical purposes, did so very imperfectly (p. vii). But the other side of the argument is that the clear description of the morphological aspects of all plants is necessary before experimentation can take place. Bacon was correct in foreseeing the value to science of planned co-operative research and it was just such co-operative compilation which multiplied Turner's identifications. In addition, scientific discovery is directed by the leap of individual minds, such as those of Hooke, Grew and Ray.

Such leaps of individual inspiration need the springboard of an accurate and intensive compilation of facts, and thus it might be conceded that each new observation, or fact recorded, is the basis of conceptualism, as A.R. Hall suggests in the second chapter of his book The Scientific Revolution. Even today in microbiology and parasitology, compilation continues to play an important part in the advance of the science, although the observation procedures are more sophisticated owing to improved technology and improved chemical understanding.

Maybe the most important contribution the Royal Society made to the advance of science was in reporting its observations and experiments in clear and precise English. Generally speaking, it would be true to say that at this time, the less a man was connected with academic university life, the more likely he was to write in English instead of Latin. Furthermore, since the Society felt that accurate knowledge of the natural world was the right of every man, it felt a corresponding responsibility to write up its findings in simple and straightforward prose.

The Society was sufficiently concerned about the English language to consider, in 1664, its study and reform. John Evelyn made some excellent suggestions regarding simplified spelling and the compilation of dictionaries which would give the natural, plain meaning of a word first, before its symbolic

meaning. He advocated the determination of words connected with measures of various kinds, the acceptance of technical words from everyday life as well as from books, and the absorption of foreign words to fill English deficiencies. However, having begun this, the Society did not follow it through, and though many of the suggested reforms did come about, it was slowly over the next couple of centuries, as society itself recognised the need for them.

Meanwhile, however, the Society did advocate an English style, but more through example than precept. Thomas Sprat, who wrote the History of the Royal Society in 1667, described the ideal style as having "a 'naked' directness and simplicity of expression" (Stimson, p. 109). Its foremost exponent was Dr. John Wilkins: Edmund Gosse, the English literary critic, praised highly his "short, pointed and exact" sentences (quoted by Stimson, p. 109). Wilkins conceived the idea of a universal written language and towards this end tried to classify all knowledge and reduce it to such essentials as could be expressed symbolically. In these classifications he was helped by John Ray, whose own future classifications of plants and fishes it perhaps influenced. But Ray chose to write his botanical works in Latin and it is more interesting to see what happened to the art of plant description in English between the time of Turner and the Royal Society's early years.

There were surprisingly few advances in technical terms. Although the information given was more orderly - the habit of a plant, its stalks, branches, leaves, flowers, seed and root were all considered - the semi-scientific terms had only changed in a few instances. "Footstalk" which Turner uses sparingly, occurs frequently in John Goodyer's descriptions (c. 1620-1640) and is not replaced by "peduncle" until Linnaeus in the eighteenth century. However, Nehemiah Grew, in his Anatomy of 1682, describes stamens, which he calls "seminiform attire", as "a little Sheaf of seed-like Particles; standing on so many Pedicills, as the Ear doth upon the End of the Straw."[12] Here Grew is using Pedicill to indicate the minute stalk - now called the filament - which bears the anther, the anther and filament together forming the stamen.

The fact that Grew did not use the word "stamen" but invented the pedantic "seminiform attire" illustrates how the development of English botanical terminology was by no means straightforward. The evolution of "stamen" until it carried its modern botanical meaning indicates the difficulties in nomenclature which continued to plague botanists well after the time of Turner. According to the Oxford English Dictionary "stamen" 3, the Latin stamen had been applied by Pliny to the stamens of the lily, but its specialised botanical use began with Adriaan van den Spieghel

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[12]Nehemiah Grew, The anatomy of plants. With an idea of a philosophical history of plants, and several other lectures, read before the Royal Society (London, 1682), Micro Fi. 123, Ch. 3, p. 167.

(d. 1625), a botanist of Padua who in his Isagoges in rem herbariam of 1606 gave detailed instructions for forming collections of dried plants (Arber, p. 142), and also defined "stamina" as "partes oblongae tenues veluti capillamenta ... quae stylum (partem similiter oblongam sed paula crassiorem)". This might be translated as "the thin longish parts like hairs ... which [resemble] the stalk (a part similarly rather long but a little thicker)".

In England "stamen" was not recognised in the nomenclature until much later. It was shown in the last chapter that Turner uses the term "threads" to denote, amongst other things, the filamentous organs in flowers generally, stamens and pistils not being clearly differentiated by him in technical terms. Gerard substituted "chive" or "cheive" for Turner's "threads", both indicating again what today would be called either stamens (the male organs of flowers) or pistils (the female organs). Before Gerard's time "chive" had usually referred to the thread-like style or stigma of a flower (which together with the ovary form the female organs, i.e. now the pistil), but by the time that Goodyer was writing in the early seventeenth century "cheive" had come to indicate the male organ (i.e. today's stamen) fairly exclusively. For example, this is Goodyer's description of Corn Parsley: "the flowers are white, and grow most commonly at the tops of the branches, sometimes at

most of the joynts even from the earth, in uneven or unorderly umbells, every flower having five exceeding small leaves, flat, and broad at the toppe, and in the middle very small cheives with purple tops" (Gunther, p. 121). Nehemiah Grew was also using chive in 1672 to refer to the male organ of the flower, but sometimes to indicate the lower part only (i.e. today called the filament) whilst he referred to the upper part (i.e. today called the anther) as the "semet", thus: "These Semets are sometimes fastned so, as to stand erect above their Chive" (Anatomy, p. 38). However, despite the increasing association of "chive" with the male organ, the word was wrongly applied to the ovary of the flower as late as 1727 (O.E.D. "chive" ^{2}2b).

Similarly, Gerard and others of his time, use "pointell" seemingly as an alternative to "chive" to indicate the filamentous male or female flower organs, and the word continues to be used in this dual sense in non-botanical works as late as 1831 (O.E.D. "chive" ^{2}1). But Goodyer used "pointell" more exclusively for the pistil or female organs, although it was not until 1700 that "pistil" was used (in its Latin form pistillum) by Tournefort and strictly defined as "the female part of the flower" in 1760 (O.E.D. "pistil" 2). There is little wonder that Raven, in commenting on Goodyer's style, says his descriptions are in "clear, and for the time, technical language" (English Naturalists, p. 292). Such small advances as have been

made in botanical terminology, are evident in Goodyer.

If one reads the botanical sections of Robert Hooke's Micrographia (1665) it is obvious that Hooke has no new and clear terminology to describe the fine details he is able to observe under his compound microscope. Several phrases are reminiscent of Turner, a hundred years earlier. For example, Hooke describes the seed case of moss as "full of exceeding small white seeds, much like the seed-bagg in the knop of a Carnation, after the flowers have been two or three days, or a week, fallen off" (p.132); and the growth he has observed on a roseleaf has "several small yellow knobs, of a kind of yellowish red gummy substance, out of which I perceiv'd there sprung multitudes of little cases or black bodies like Seed-cods" (ibid., p. 121). Poppy seeds "grow in a Case or Hive" (p. 155); purslane-seed is "coyl'd round in the manner of a Spiral"; and the whole surface is "cover'd over with an abundance of little prominencies or buttons" each of which resembles "a Wart upon a man's hand" (p. 156).

Hooke is still using the language of comparison and the "knop" and "cod" as Turner did. The different types of fruit are not yet familiarly differentiated as "legume", "follicle" and "capsule", though "follicle" was used soon afterwards by John Evelyn in his book on arboriculture, Sylva, or a Discourse of Forest Trees which was given the

Royal Society's imprimatur of approval. Although the book was published in 1664, it was not until the 1706 edition that the word appears: "They [the Maples] are all produced of Seeds contained in the Folliacles and Keys, or Birds-Tongues" (O.E.D. "follicle" 2) and here the word is being used generally to mean a capsular fruit. "Capsule" itself did not appear until much later in any specific sense, though it did appear in 1713 used by Derham to indicate a seedcase: "The little cases or capsules which contain the seed in this species [the fern]" (O.E.D. "capsule" 1). Leeuwenhoek used the Latin form of the word in 1693: "So soon as the Capsula breaks upon the ripening of the Seed" (O.E.D. "capsule" 3a); and Withering explained it in the modern botanical sense in 1776 as follows: "A Capsule with two boat-shaped Valves, and one Cell; the Valves opening length-ways" (O.E.D. "capsule" 3a).

It will be noticed that both "follicle" and "capsule" are derived from the Latin. In Turner's time the centre of scientific activity was undoubtedly the continent. With the founding of the Royal Society, the focus shifted to England somewhat and many learned continental scientists, including the above-mentioned Leeuwenhoek, sent the results of their experiments to the Society in England or appeared before it in person to demonstrate their work. Leeuwenhoek, in fact, left his invaluable collection of high-powered

microscope lenses to the Royal Society when he died. Therefore, despite the Society's stress on a clear English style and its encouragement of publications in English, the more international a discussion became, the more likely that Latin was used as the common language.

Nehemiah Grew, in his Anatomy, attempted to introduce several words in a technical sense to describe those parts of a plant which he was discovering in his dissections. For example, he divided the flower into three parts, which he called the "Empalement", the "Foliation" and the "Attire" (Chapter 1, p. 5). By empalement he meant the (usually green) leaves covering the flower whilst it is in bud; but the word eventually became obsolete in favour of the Latin based "calyx" used in 1671 by Malpighi and in 1686 by Ray, both members of the Royal Society. Malpighi used 'calyx' in his Anatome Plantarum and Ray used the same term in his Historia plantarum. Each of these works was written in Latin, as distinct from Grew's Anatomy, which was in English.

Similarly Grew's use of "foliation" for the flower leaves or petals was supplanted by the Latin word "corolla", introduced by Linnaeus in the eighteenth century. Grew's word "attire" to describe those parts within the petals was not adopted either, partly perhaps because he divided the "attire" into two kinds, the "Seminiforme" and the "Florid".

It has been shown above that "seminiform attire" was eventually supplanted by "stamen" from Spieghel's Latin "stamina", and Grew's "semet" and "chive" became "anther" and "filament" respectively. Again, both these words were Latin based. "Anthera" had been used by Turner in the second part of his herbal when quoting from Dioscorides, to indicate a "medicine extracted from flowers": dried rose petals "are mingled with medicines called anthera and preservative medicines for woundes" (Herbal, Part 2, fol. 116). According to the Oxford English Dictionary these medicines usually consisted of the internal organs of the flowers and therefore about 1700 the name "Anthera" was confined by herbalists to the pollen-bearing organs. Linnaeus sanctioned its use for the upper part of the stamen and around the middle of the eighteenth century "filament" was used to indicate the lower stalk.

It seems that of the botanical terms which Grew introduced mainly those with a Latin base survived, presumably because they were acceptable to continental botanists and eventually to Jung and Linnaeus who are the real fathers of botanical nomenclature. 'Attire', 'semets', 'empalement' and 'foliation' all fell by the wayside of technical terminology. However, the Latin "radicle" as that part of the embryo of a plant which develops into the primary root, is still in use; also "cuticle", though Grew in 1671 used

the word to indicate the whole epidermis (O.E.D. "cuticle" 2) whereas after 1852 it meant the outer cutinized layer of epidermal cells (ibid.).

What this study would seem to show was that Turner's strength was also a weakness. His avoidance of Latin terms in his herbal means that not many of his technical terms have passed into scientific botany, even though his descriptions in English are often very good. The few Latin terms that he did include, on the other hand, are still used in a technical sense. His "palmus" is remembered in "palmate" leaves - those having a form like an open hand: his "pediculo" in "pedicle", a minute stalk-like support. "Perforata" has become part of the Linnaean name for St. John's Wort - Hypericum perforatum - and "panniculam" is recognised in "pannicle", a membranous covering in plants such as "the scales investing a leaf-bud" (O.E.D. "pannicle" 2).

Had Turner written his herbal in Latin he might have contributed far more significantly to botanical terminology than he did. But maybe that loss to scientific botany was a gain to English scientific prose nonetheless, that is to the scientific prose of botany. Turner did much to separate botanical fact from folklore and fiction; he exemplified patient personal observation and the honest record of it; and to some degree he brought the art and task of plant identification within the reach of any Englishman

who could read.

Today an aspiring botanist must know Latin - or at least botanical Latin - to be able to pursue his profession, though the amateur naturalist can find many good plant guides in English. As in most other fields, amateurs and professionals are now widely separated. Turner and the members of the Royal Society were only at the start of this rather regrettable but necessary division. For them it was still possible to make significant strides in botany based on patient observation, intellectual honesty and a lively curiosity. Although Turner's work has been corrected and surpassed, as Dr. Bulleyn said of Turner's "Book of Herbs", it "will always grow green."[13]

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[12]Quoted in Pulteney, p. 58.

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